AUTOMOTIVE INDUSTRIES

AUTOMOTIVE and AVIATION MANUFACTURING
ENGINEERING • PRODUCTION • MANAGEMENT

FEBRUARY 15, 1956

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Development of the Powermatic Transmission
Automatic Setup for Brazing Jet Stator Blades
Unique Production Methods for Chevrolet Frames
Diesel Pilot Injection Versus Cetane Numbers
Building Aircooled Engines in Versatile Plant
Forge Shop Instrumentation Reduces Rejects

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A CHILTON PUBLICATION

3 WAYS *to get greater precision and*

HIGHER EFFICIENCY

in rotary surface grinding...

new MODEL 161

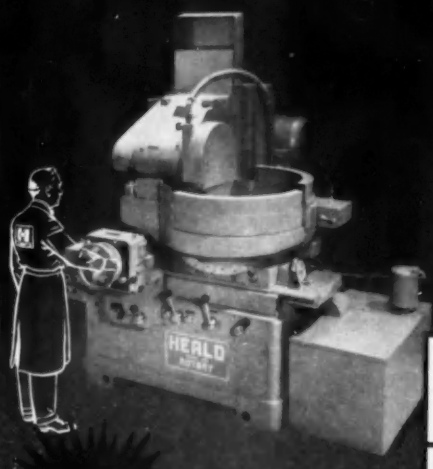
SMALL SIZE WORK

This compact, low-cost machine with 6″ magnetic chuck grinds flat, concave or convex surfaces to extremely low microinch finish. Features include rigid, column type construction, manual or power reciprocation, simple mechanical reversal, "right-hand" operation and powerful direct-drive wheelhead. For complete information, send for Bulletin 1-161.

MODEL 261

MEDIUM SIZE WORK

Available with 12″ or 16″ rotating chuck, this heavy-duty machine does high precision surface grinding on a wide range of small to medium-size work. Smooth, hydraulic operation of wheelslide and table reciprocation can be arranged for manual or fully automatic control. Vertical column construction places wheel pressure directly over table ways for maximum rigidity of support. Grinds flat, convex or concave surfaces. Bulletin 1-261 gives complete details.



new MODEL 361

LARGE SIZE WORK

A massive, heavy-duty machine with 24″ rotating chuck for precision grinding of flat, convex or concave surfaces on large, heavy work. Available with either manual or fully automatic control. Heavy, rugged base and column construction, with smooth, infinitely variable hydraulic feeds, assures freedom from chatter and vibration. Hydraulic power unit with multiple pump system provides separate lubrication pressure and operating pressure. For further details, send for Bulletin 2-361-V.

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135-DKB Series DIESELS
Turbocharged (shown) **or Normal**
426 cu. in.; 100 to 187 hp.

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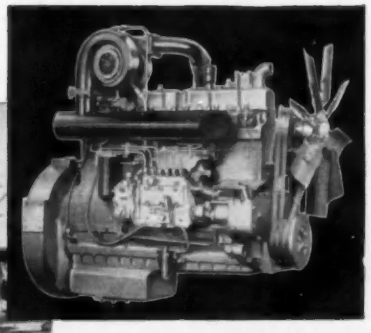

148-DKB Series DIESELS
Turbocharged (shown) **or Normal**
779 cu. in.; 170 to 280 hp.

OFF THE HIGHWAY

...in and out...down and up...over and through
...go the trucks with Waukeshas—148 Series Diesels putting out the power that pulls and pays.

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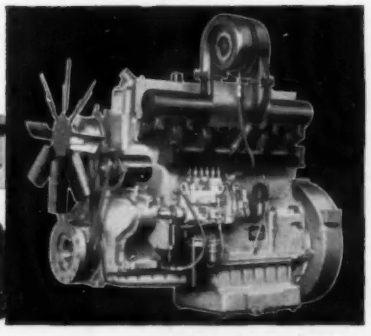

...those tremendous, crushing 30-ton, 35-ton, 40-ton loads
...up stiff grades, without faltering or breakdown
...day after day—with Waukesha WAKDB Series Diesels.

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Send for Bulletins

262 R

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New York Tulsa Los Angeles

THE "Jet Age" COMES DOWN TO EARTH

Tomorrow we may have radically different trucks on the highways.

In fact, there are some now — experimental models. They have gas turbine engines not too different from those of jet aircraft.

These engines weigh one tenth the weight of a Diesel of equivalent horsepower. They have faster pickup and make only a quiet hissing sound.

But there are some things holding up their commercial production. Among them, high temperatures and corrosion.

Right now, automotive engineers are looking for materials to withstand the oxidation and corrosion of high temperature operation. For these new engines they need the unusual combinations of strength plus oxidation and corrosion resistance. And in such places as turbine wheels and buckets, where components spin at 22,000 rpm in seething combustion gases, they need a material with high creep strength, too.

Fortunately, there are Inco Nickel Alloys such as Inconel "X" and Inconel, Nimonic 75 and Nimonic 80A, which have these desirable properties. And since they are standard alloys—in production for many years for high temperature applications — there is accurate, scientifically-obtained, information about them.

Furthermore, because of continual regular production at Inco's Mill, these unusual alloys cost less than experimental, special-melt alloys of comparatively rare metals. There is also less variation between melts of an Inco Nickel Alloy.

Inco's High Temperature Engineering Service can help you apply the Inco Nickel Alloys to your special high temperature problem; whether it be in automotive gas turbines or some other phase of your operation.

As the first step, write for a high temperature work sheet. If you also request information on stress-to-rupture, creep rate, or oxidation characteristics of Inco Nickel Alloys, Inco's High Temperature Engineering Service will supply it, too.

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AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE — PUBLISHED SEMI-MONTHLY

FEBRUARY 15, 1956 — VOL. 114, NO. 4

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AUTOMOTIVE INDUSTRIES is a consolidation of The Automobile (weekly) and the Motor Review (weekly) May, 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.

EDITORIAL EXECUTIVE OFFICES, Chestnut and 56th Sts., Philadelphia 39, Pa., U. S. A. Cable address—Autoland, Philadelphia.

AUTOMOTIVE INDUSTRIES. Published semi-monthly by Chilton Co., Chestnut & 56th Sts., Phila. 39. Entered as Second Class Matter October 1, 1925, at the Post Office at Philadelphia, Pa.; Under the Act of Congress of March 3, 1879. In case of Non-Delivery Return Postage Guaranteed. Subscription price: United States, United States Possessions, 1 year $2.00, 2 years $3.00. Canadian and Foreign, 1 year $5.00, 2 years $8.00; single copies, 25 cents, except Statistical Issue (Mar. 15th), $1.00

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Notice how the appearance of this husky little machine is enhanced by the clean, smooth lines of the Allen cab.

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News about

B. F. Goodrich Chemical *raw materials*

Hycar rubbers in automotive design ...for heat and oil resistance

HYCAR rubbers, with their outstanding qualities of resistance to gas and oil and extremes of temperature are opening doors for the design engineer.

Hycar nitrile rubbers can be compounded for exceptional oil and aromatic solvent resistance or low temperature flexibility. Hycar polyacrylic rubbers withstand oil and dry heat up to 350° F.

Whatever the compound of Hycar rubber, these characteristics stand out:

1. **Hycar vulcanizates are oil resistant.**
2. **Resist most solvents and chemicals.**
3. **Excellent abrasion resistance.**
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5. **Low compression set characteristics.**
6. **Low gas permeability.**
7. **Color range is unlimited.**

The design possibilities of Hycar have led to many outstanding automotive improvements. For example: brake expanders and liners, diaphragm materials, gaskets, packing, seals, fuel and oil hose, mountings and bushings, mats and flooring.

Perhaps Hycar can help solve a design problem for you. If you want to investigate the possibilities of Hycar rubbers, please write Dept. EA-1, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

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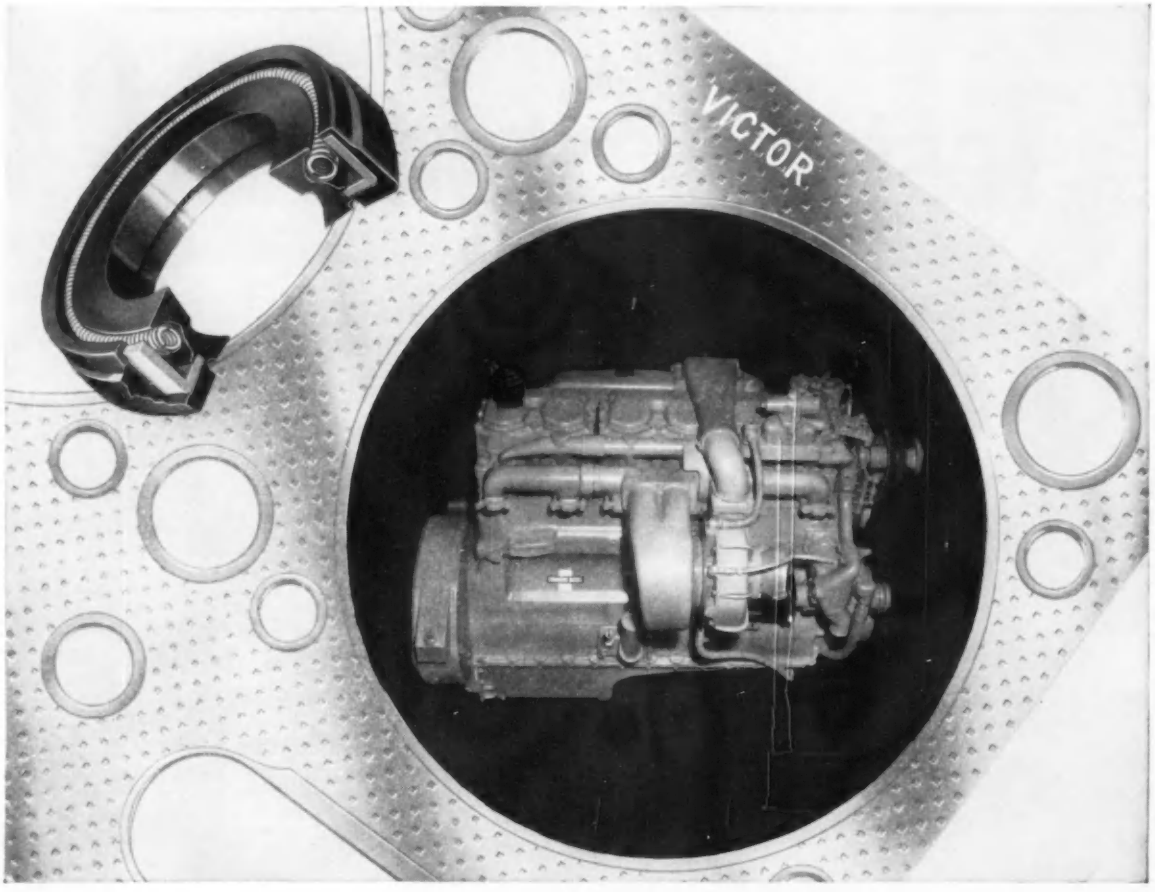

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- VICTORITE PACKING
- VICTOR MANIFOLD GASKETS

By matching power to job requirements, Cummins Turbodiesels deliver long-life, low-cost performance. And Cummins' designers see to it that maximum horsepower output is maintained.

With quality sealing components they prevent fuel waste and compression loss, and leakage of lubricant and coolant. They know that quality in these parts—gaskets, oil seals and packings—makes a powerful difference in engine performance.

Victor sealing is quality sealing for all types of heavy-duty power units. Victor's continuing research and development of materials and structures assure the ultimate design for each sealing need. Each Victor packing, for example, is classified and defined for service by SAE-ASTM specification.

In addition to sealing skill since 1909, Victor offers unmatched facilities for quality mass production. Let's get our engineers together.

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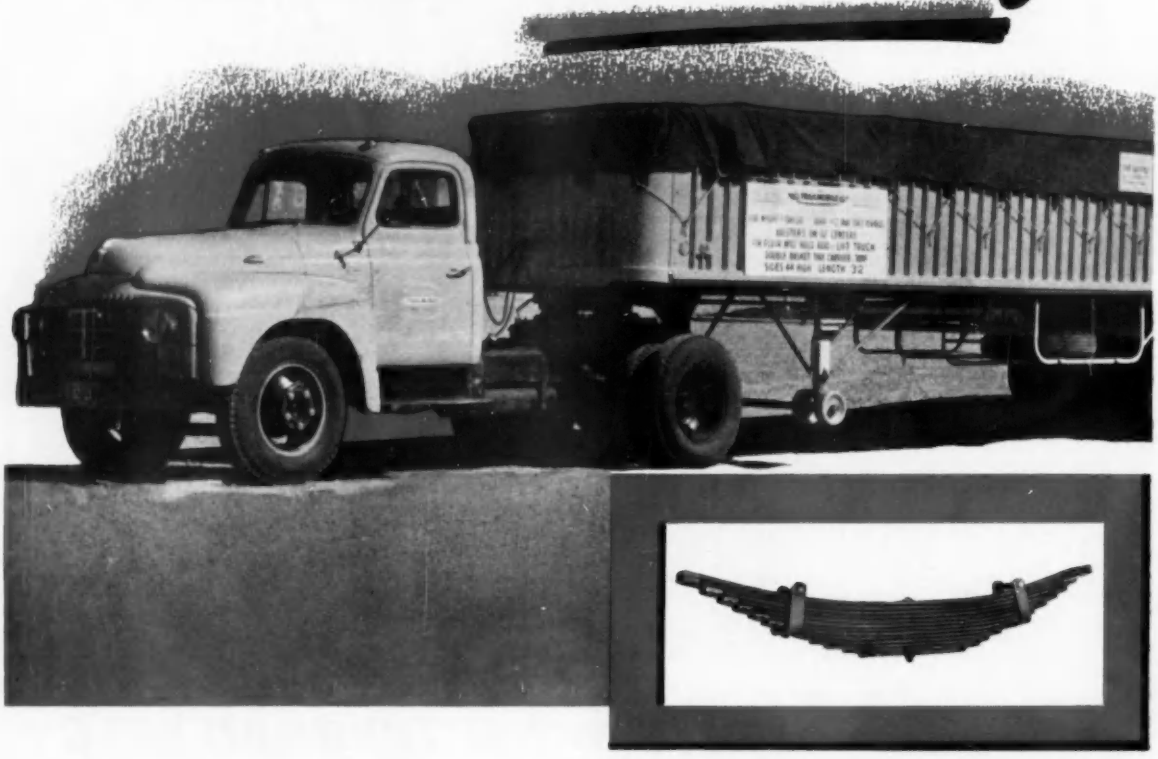

IT'S a rugged test for a truck or trailer . . . day in and day out . . . year after year . . . over all kinds of roads, in all kinds of weather.

But TRAILMOBILE knows how to build vehicles that will pass such tests of stamina. And, because of the extreme requirements of their heavy transport equipment, BURTON takes a special pride in supplying springs which contribute so vitally to Trailmobile performance.

Your own special spring problems, too, may find best solution through BURTON experience in spring engineering. We invite consultation.

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The PRATT & WHITNEY BG-22 KELLER

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Standard-size Type BG-22 Keller Machines have work size capacities of 10′ x 5′, 12′ x 6′ and 14′ x 7′. Machines with special combinations of travels required to do specific jobs can be built on order.

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P & W Keller Machines are designed and built specifically for tracer-controlled milling and can handle a wide variety of jobs without major adaptation by expensive attachments.

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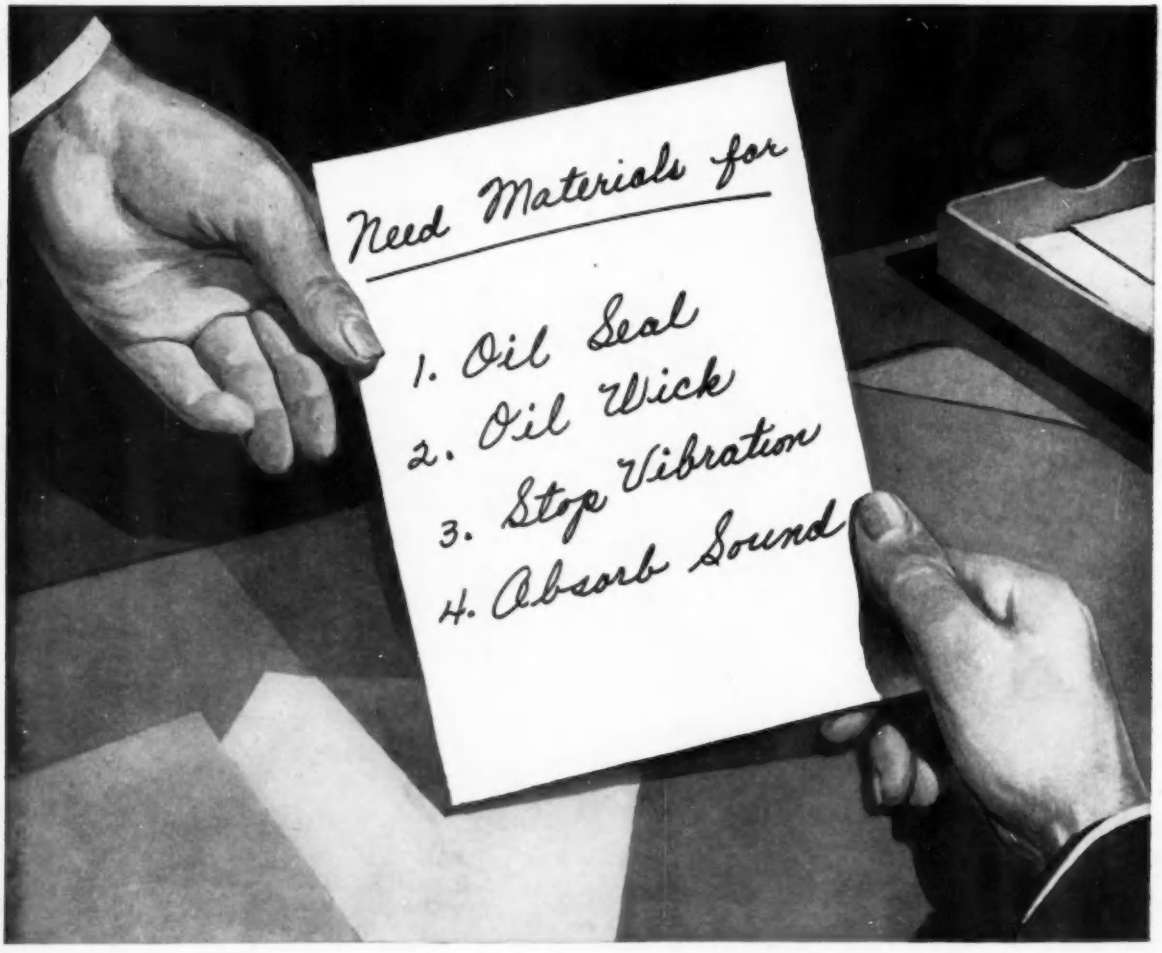

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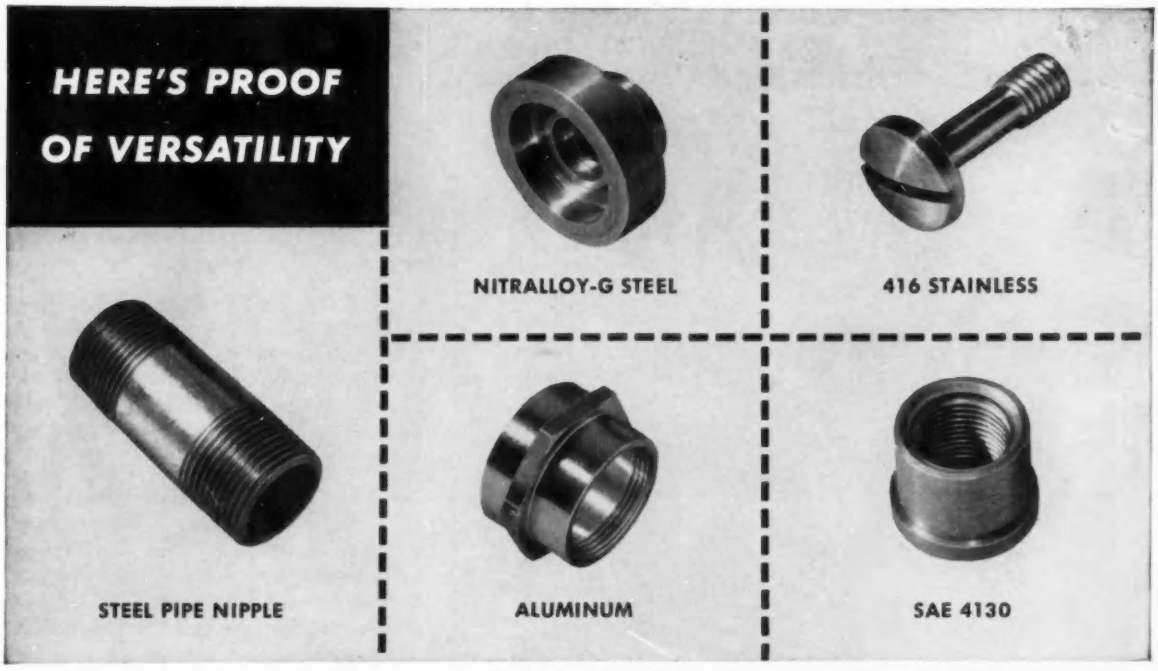

SUN DEVELOPS VERSATILE NEW CUTTING OIL FOR SCREW MACHINES AND JOB SHOPS

New cutting oil, Sunicut 5534, is moderately priced... gives excellent machining results on wide range of steels

New Sunicut 5534 is a non-emulsifying, transparent cutting oil specially compounded to give above-average machining results to operators who want a single oil to machine a large variety of ferrous metals.

Tests have proved that new Sunicut 5534 meets this demand for an all-purpose cutting oil. It is ideal for general screw machine and turret lathe work. It is also excellent for tapping, drilling, threading, and light stamping operations. In addition, new Sunicut 5534 can be used on many special machining jobs, both high and low speed, with metals ranging from B1112 to 4130 as well as free-machining stainless steels.

For complete information about new Sunicut 5534 and how it can help you reduce your oil inventories... lower your production costs... see your Sun representative. Or write SUN OIL COMPANY, Phila. 3, Pa., Dept. AA-2.

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INDUSTRIAL PRODUCTS DEPARTMENT

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IN CANADA: SUN OIL COMPANY, LTD., TORONTO AND MONTREAL

From a dream-world marriage of mathematics and electronics...tomorrow's oil seals today

Looks simple, doesn't it—the oil seal pictured here. Actually, it's a precision assembly of high tolerance parts, each the product of painstaking engineering.

One such part is the unseen but vital tension spring behind the sealing lip. Thousands of these springs—all different—are needed in the broad line of National Oil Seals. Each spring must have exactly the size, coil diameter, tension, spring rate, and heat treat required for the oil seal it fits.

Done the conventional way, calculations of characteristics for thousands of springs would take months. So, National Oil Seal Engineers developed new mathematical methods which, in combination with Univac, permit specifications to be determined at speeds up to 150 per minute.

This fortunate marriage of mathematics and electronics is another example of efficient, "future" National Oil Seal engineering—and another reason why National consistently brings you tomorrow's oil seals today.

NATIONAL
OIL & GREASE SEALS
O-RINGS SHIMS

New Sealing Lip Design. Recent development of NMB Engineering is new lip design. New features include long, thin lip section and small coil diameter tension-spring. Contact on shaft is light, yet effective sealing is maintained throughout long service life.

NATIONAL MOTOR BEARING CO., INC.
General Offices: Redwood City, California
Plants: Redwood City, California and Van Wert, Ohio

3548

One large Cleveland and two smaller vertical worm gear units operate this Medart No. 3 RPPD machine which cold-finishes steel bars at the rate of 12 feet per minute.

CLEVELAND "Siamese twins" feed and discharge bars

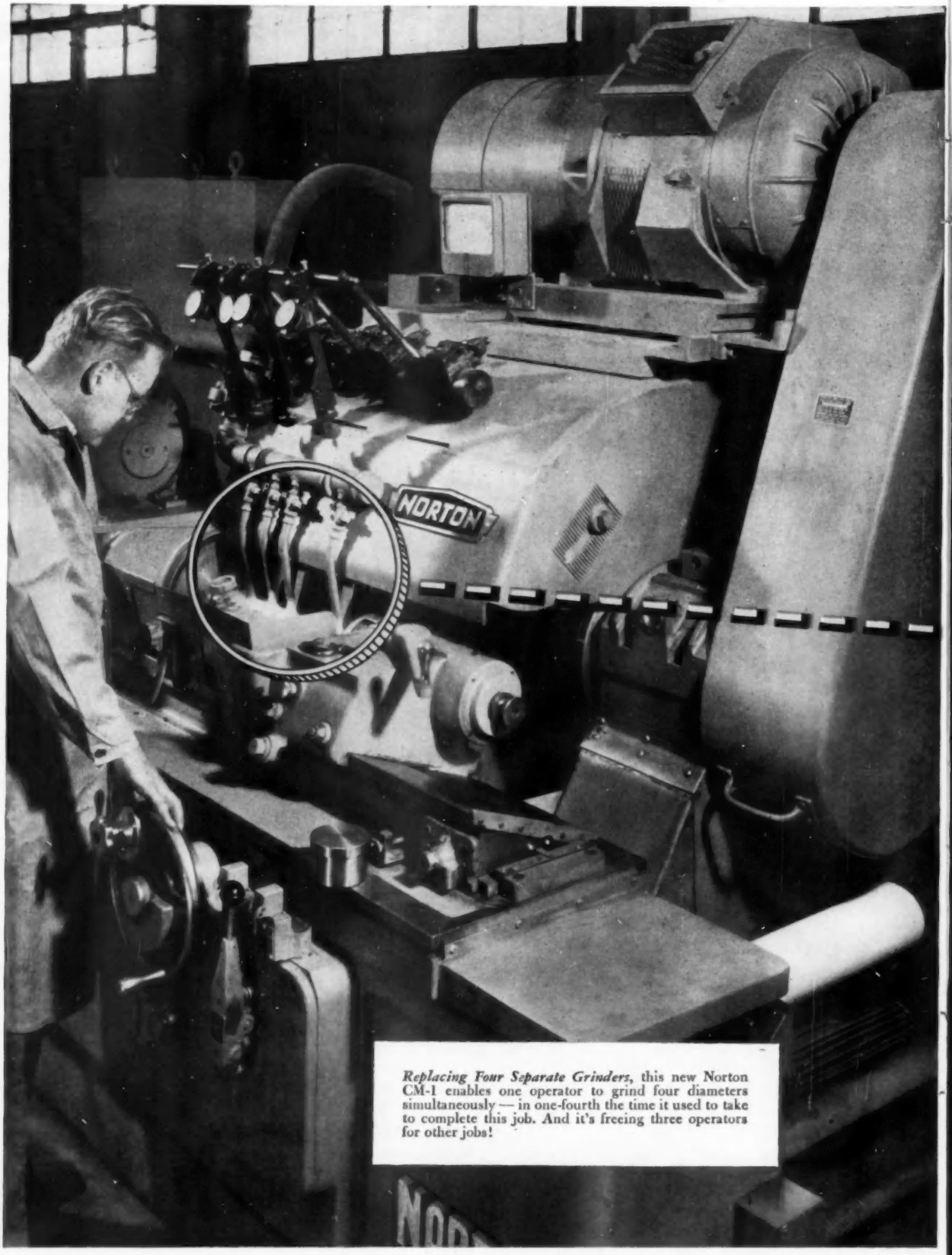
HEART of the feed and discharge mechanism of this Medart Centerless Bar Turner is a trio of Cleveland worm gear speed reducers. One large Cleveland unit drives cold-finished bars through the cutterhead. The "Siamese twins", two Cleveland vertical units mounted head-to-head, pull the workpiece back at speeds of 3 to 12 feet per minute and then return the carriage at 75 feet per minute for a new workpiece.

This unique installation demonstrates again how Cleveland vertical and right-angle drives save valuable space and streamline machine design. Functional design is just one Cleveland advantage. Another is Cleveland's dependability and long wear. Sliding action of case-hardened steel worm on nickel-bronze gear transmits power with a smooth, uninterrupted torque flow.

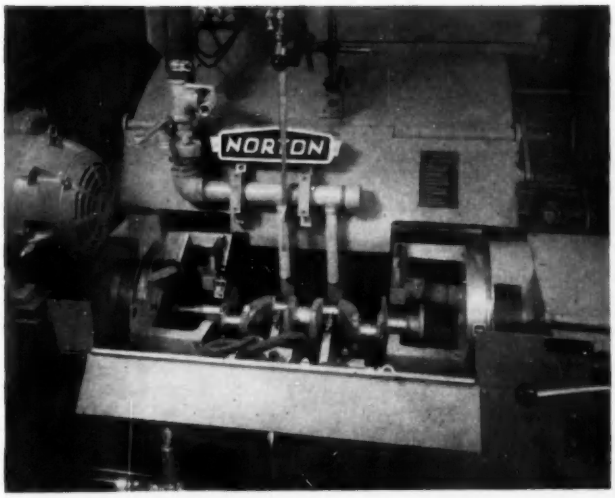
For the best in worm gear drives, get those made by a worm gear specialist: Specify Cleveland! Write for free Catalog 400. The Cleveland Worm and Gear Company, 3274 East 80th Street, Cleveland 4, Ohio.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication. In Canada: Peacock Brothers Limited.

CLEVELAND
Worm Gear
Speed Reducers



Replacing Four Separate Grinders, this new Norton CM-1 enables one operator to grind four diameters simultaneously — in one-fourth the time it used to take to complete this job. And it's freeing three operators for other jobs!



A Great New Production Tool. The Norton Type CM-1 Heavy Duty Semi-automatic Multi-Wheel Grinder brings new efficiency and economy to the grinding of parts having multi-diameters—such as crank and camshafts, transmission and motor shafts, etc. Machine shown arranged for grinding two pins on automotive shaft. Machine is available also with power assist loading mechanism for certain jobs.

Here's a new Norton Grinder to

boost your production rate

400% or higher

Type CM-1 Heavy Duty Multi-Wheel Grinder does four or more jobs at once, reduces capital investment, cuts operating time and costs

When you can get one machine that does the work of several, in a fraction of the working time, you save considerably on purchase costs, on operating costs, and on floor space.

That machine is now ready to go to work for you. The new Norton CM-1 makes four or more cuts in a single plunge-grind cycle, operating automatically under one-lever control. And it completes each separate grinding operation with the accurate, trouble-free performance that's built into every Norton grinding machine.

Typical Advanced Features

- Cartridge type bearings at each end of heavy, 10"-diameter wheel spindle assure extreme rigidity of spindle, longer wheel life, greater accuracy and control with minimum truing.
- **Automatic truing device — in rear, out of operator's way — trues straight or formed wheels each individually, yet all at once, thus requiring only the amount of time needed to true widest wheel.**
- Automatic compensation for collective wheel wear, including amount trued off. No adjustment or resetting of wheel needed after truing.
- **Optional equipment includes built in automatic sludge remover and coolant filter, constant peripheral wheel speed control, increased power for wheel or work drive, etc.**

Why not get the complete story of how the CM-1 can benefit your grinding operations? See your Norton Representative, or write us direct. And remember: only Norton offers you such long experience in both grinding wheels and machines to bring you the "Touch of Gold" — to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

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Rugged, high-powered

Sturdy, dependable Model B Tournapull, made by LeTourneau-Westinghouse Company, Peoria, Ill., works in all underfoot conditions without stalling. This 23-yard-capacity, 30-ton-load unit uses reliable Bundyweld Steel Tubing for fuel and air lines—eight parts in all, totaling 59′ 5″.

WHY BUNDYWELD IS BETTER TUBING

Bundyweld starts as a single strip of copper-coated steel. Then it's . . .

continuously rolled twice around laterally into a tube of uniform thickness, and

passed through a furnace. Copper coating fuses with steel. Result . . .

Bundyweld, double-walled and brazed through 360° of wall contact.

←

NOTE the exclusive Bundy-developed beveled edges, which afford a smoother joint, absence of bead, and less chance for any leakage.

earthmover depends on extra-strong Bundyweld

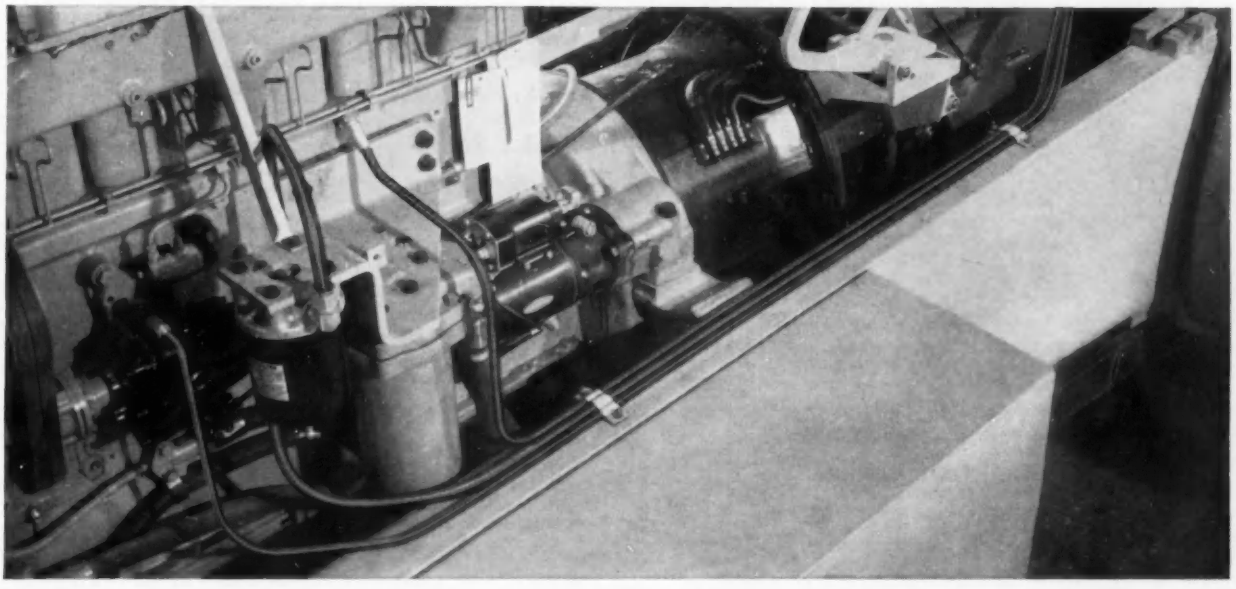
A familiar sight on highway projects across the nation, the Model B Tournapull works through all kinds of weather and surface conditions without difficulty.

The manufacturers of this rugged, high-powered earthmover naturally insist that all its component parts be *extra*-dependable, *extra*-reliable. That's why they specify sturdy Bundyweld Steel Tubing for vital fuel and air lines.

Remember, when dependability *counts*, you can count on Bundyweld. Bundyweld is leakproof by test; thinner walled, yet stronger; is remarkably resistant to vibration fatigue; has high bursting strength. It's the only tubing double walled from a single metal strip, copper-brazed throughout 360° of double-walled contact.

Bundy backs up its unexcelled tubing with the finest fabrication services; with expert engineering know-how and technical assistance; with custom-packaging of orders, on-schedule deliveries. In addition, our engineering staff *enjoys* finding solutions to tricky tubing problems. Call, write, or wire us about your particular headache.

BUNDY TUBING COMPANY • DETROIT 14, MICH.



Above, engine of Model B Tournapull during assembly process, showing fuel and air lines of Bundyweld. Dependable Bundyweld Tubing helps keep these powerful earthmovers functioning at top efficiency, *all the time*.

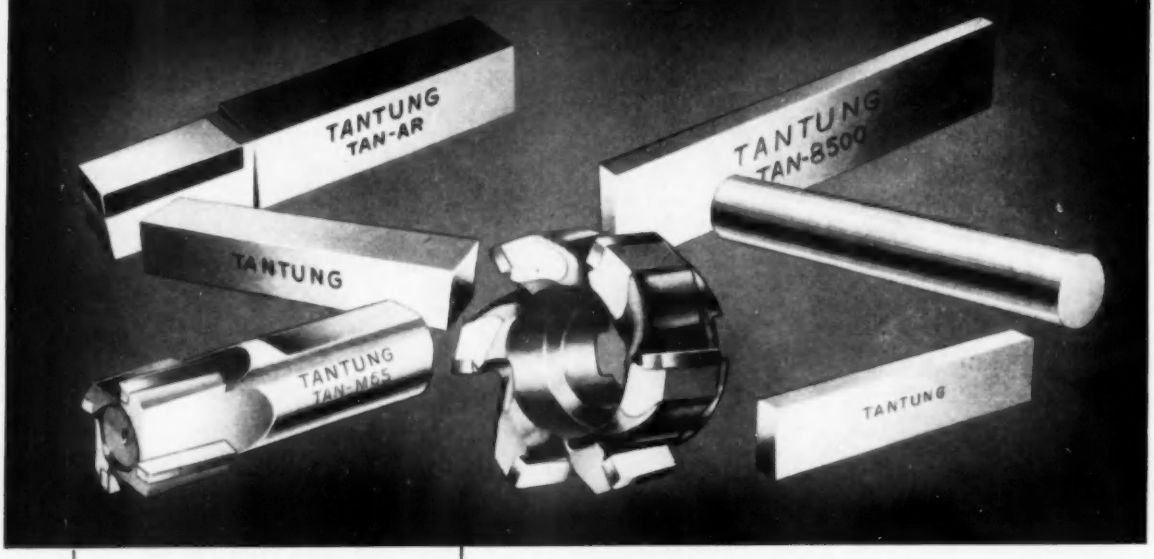
BUNDYWELD TUBING®

DOUBLE-WALLED FROM A SINGLE STRIP

Bundy Tubing Distributors and Representatives: ***Cambridge 42, Mass.:*** Austin-Hastings Co., Inc., 226 Binney St. • ***Chattanooga 2, Tenn.:*** Peirson-Deakins Co., 823-824 Chattanooga Bank Bldg. • ***Chicago 32, Ill.:*** Lapham-Hickey Co., 3333 W. 47th Place • ***Elizabeth, New Jersey:*** A. B. Murray Co., Inc., Post Office Box 476 • ***Los Angeles 58, Calif.:*** Tubesales, 5400 Alcoa Ave. • ***Philadelphia 3, Penn.:*** Rutan & Co., 1717 Sansom St. • ***San Francisco 10, Calif.:*** Pacific Metals Co., Ltd., 3100 19th St. • ***Seattle 4, Wash.:*** Eagle Metals Co., 4755 First Ave., South ***Toronto 5, Ontario, Canada:*** Alloy Metal Sales, Ltd., 181 Fleet St., E. • **Bundyweld nickel and Monel tubing are sold by distributors of nickel and nickel alloys in principal cities.**

V-R TANTUNG CAST ALLOY

cuts twice as fast as High Speed Steel



Facts You Should Know About TANTUNG, V-R's *Exclusive* Cast Alloy:

- **TANTUNG CONTAINS CARBIDES**—of tungsten, tantalum and columbium. This combination gives it superior toughness and lower friction coefficient than ordinary cast alloys.
- **TANTUNG IS STRONGER**—transverse rupture strength double of most cast alloys.
- **TANTUNG HAS HIGH RED-HARDNESS**—it maintains cutting hardness at red heat temperatures well above that of high speed steel.
- **TANTUNG IS EASY TO GRIND**—aluminum oxide wheels used for hardened steel are suitable
- **TANTUNG IS AVAILABLE PREFORMED**—when you buy preformed tools, you save grinding costs and get better cutting quality and longer tool life.

Get the Cost-Cutting Edges from the V-R Man

Call your local V-R distributor or representative.

V-R and TANTUNG are registered trademarks of Vascoloy-Ramet Corporation.

High Red-Hardness — Plus Low Friction

lets you speed up your machines and cut your costs . . .

As a general rule, when using TANTUNG cast alloy cutting tools, you start your machines at about twice the speed you would use with high speed steel tools. TANTUNG bridges the gap between the maximum speeds possible with high speed steel and the minimum speeds practical with cemented carbides. Its general cutting range lies between 80 and 180 surface feet per minute, subject to some variation according to machining operation and material being cut.

And, TANTUNG is at its best under heavy feeds!

Here is a typical example:

JOB: Recessing high alloy steel ring gear forging on Potter and Johnson Semi-Automatic.

	H.S.S.	TANTUNG
Speed:	94 R.P.M.	165 R.P.M.
Feed:	.004"	.008"
Depth of cut:	.125"	.125"
Pieces per grind:	35	70
Av. pieces per shift:	38	100

. . . more than 2½ times production increase!

If you want to reduce costs and increase productivity, take a good look at TANTUNG.

GET ALL THE FACTS in this 24-page free catalog containing charts, tables, recommendations and data. Send for yours today.

MANUFACTURERS OF:
CEMENTED CARBIDES AND TANTUNG CAST ALLOYS • TOOLS • BLANKS • DIES
TOOLHOLDERS • INSERTS • MINING TOOLS • INVESTMENT CASTINGS

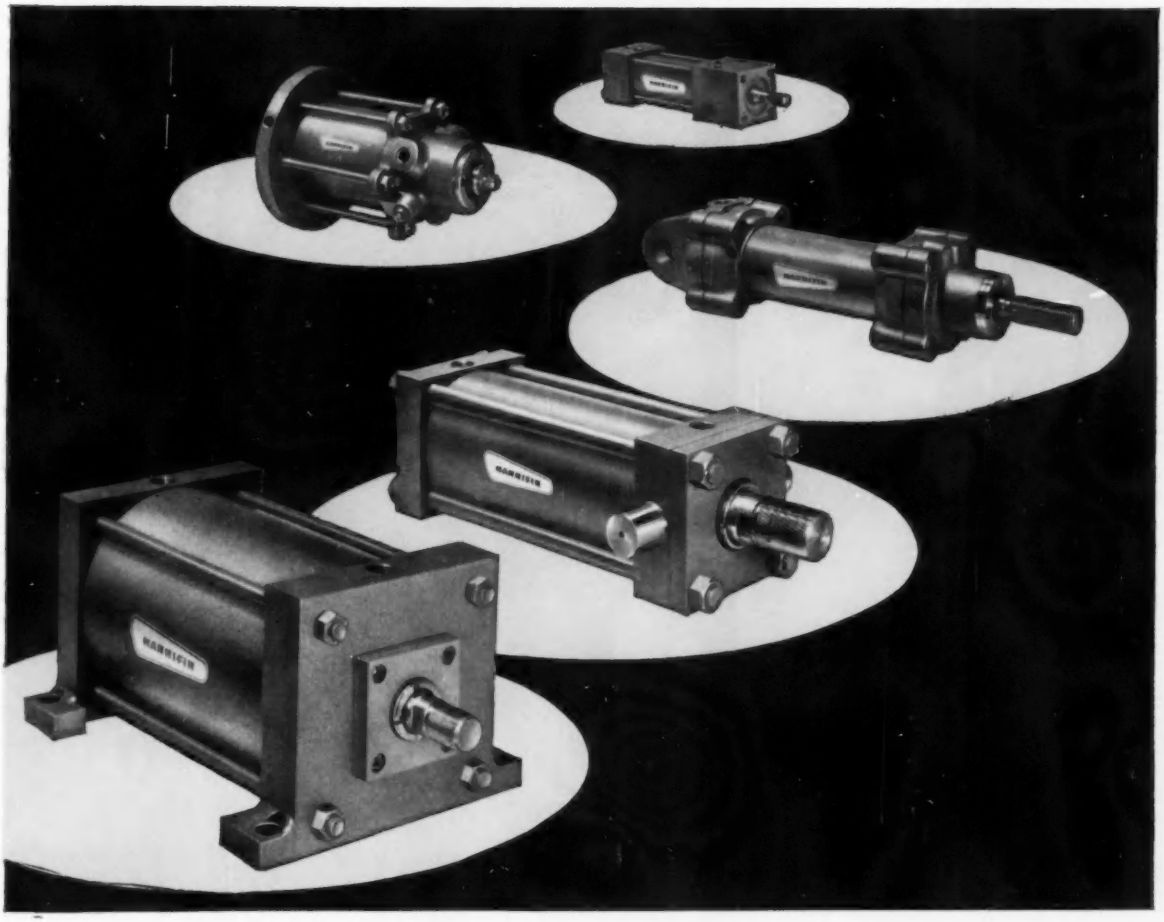
Vascoloy-Ramet Corporation

SUBSIDIARY OF FANSTEEL METALLURGICAL CORPORATION

816 S. Market Street • Waukegan, Illinois

See TANTUNG at the TOOL SHOW — V-R Booth 1137 — Chicago, March 19-23

HANNIFIN AIR AND HYDRAULIC CYLINDERS



To the engineer who wants the best cylinder—in a hurry

In the selection and purchase of cylinders look for:

Completeness of Line. Hannifin makes *five* lines of air and hydraulic cylinders in a range of bore sizes and mounting styles to meet every requirement and preference.

Leadership in Design. Hannifin cylinders are built to exacting quality standards and extremely close tolerances to insure easy, accurate mounting. Hannifin has also introduced the *externally removable* and replaceable bronze gland cartridge, the most noteworthy improvement in cylinder design in the last 50 years.

Rapid Delivery. Hannifin can ship the cylinder you need in strokes up to 60" *in any normal quantity within 48 hours.*

Field Engineers, located in all principal cities, are as near as your telephone. Or, if your requirements are really urgent, call us at Des Plaines. Experienced sales engineers will handle your order.

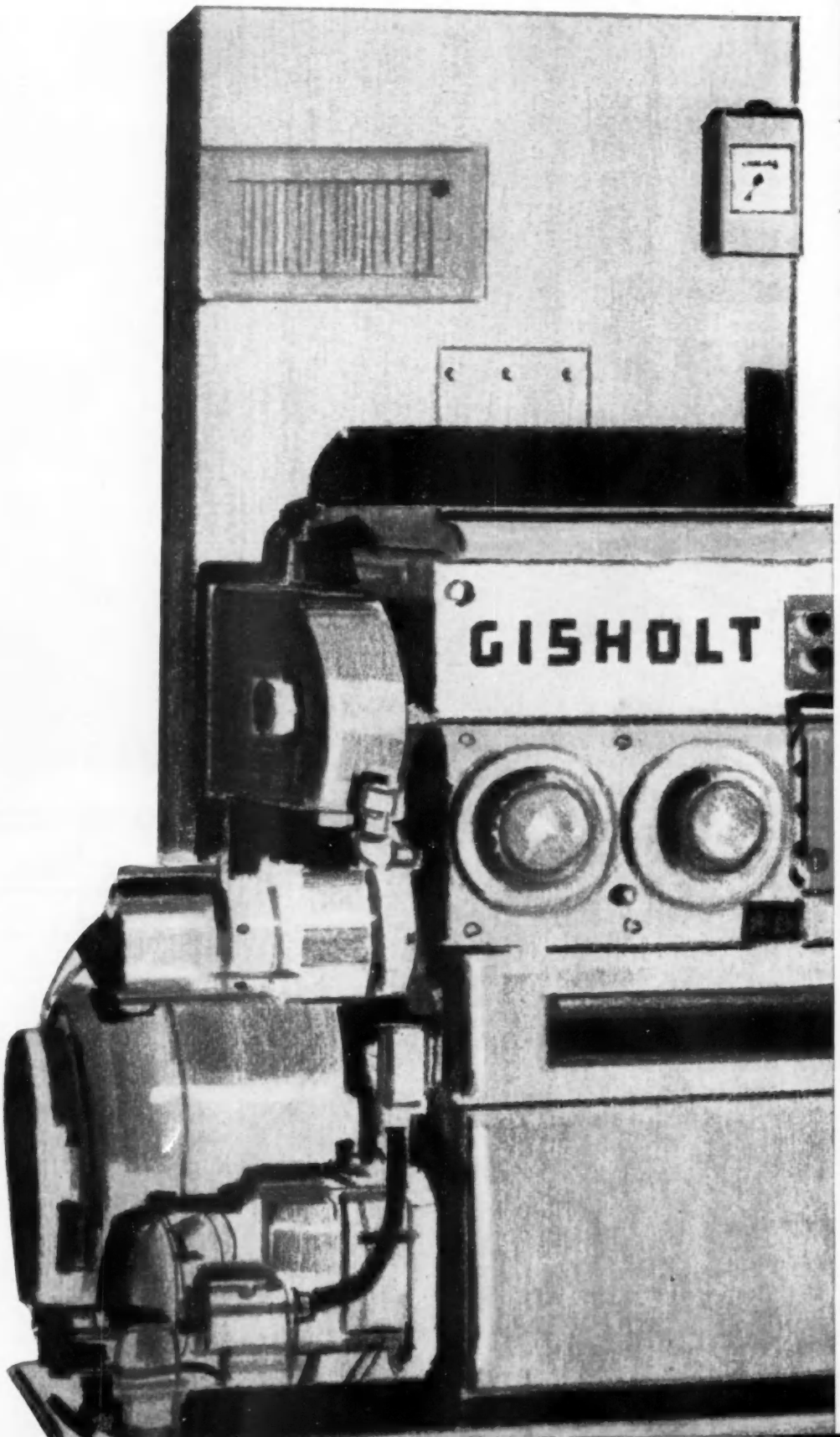
HANNIFIN

MAIL THIS COUPON FOR PROMPT ACTION

- ☐ Have Field Engineer call at once
- ☐ Have Field Engineer stop by soon
- ☐ For the present, just send complete catalog information on Hannifin cylinders including prices

Hannifin Corporation, 543 S. Wolf Rd., Des Plaines, Ill.

Name.....*Title*.....
Company.....
Address.....
City.....*Zone*.....*State*.....


GISHOLT

GISHOLT MASTERLINE NO. 12
AUTOMATIC PRODUCTION LATHE

MASTERLINE GISHOLT SINCE 1887

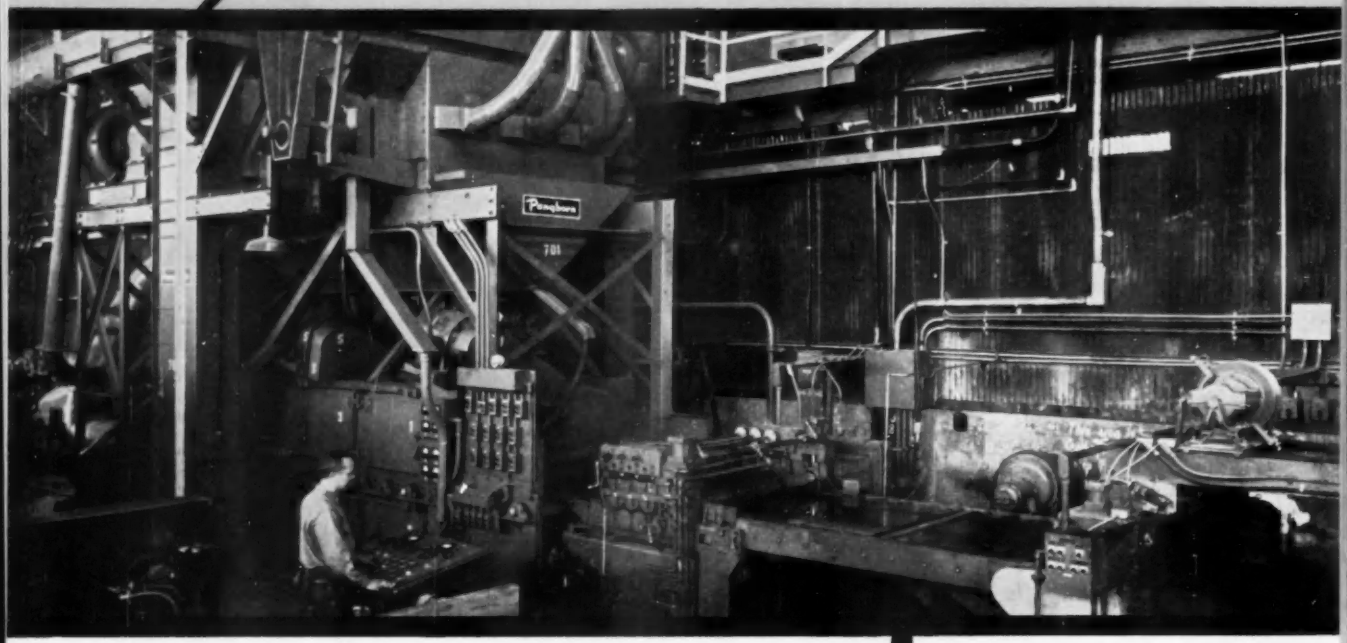
Sixty-nine years of machine tool experience have gone into this latest design of the Gisholt MASTERLINE No. 12 Automatic Production Lathe. An important contribution to metal-cutting progress, it is ready to produce faster, better and at lower cost—with even less requirements for operator skill and effort. May we tell you the complete facts about it—and how it may be profitably applied to your manufacturing processes?

Gisholt Machine Company, Madison 10, Wisconsin

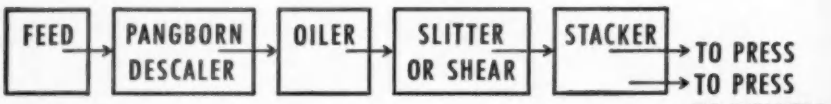
Look ahead—keep ahead—with Gisholt

STEEL FABRICATORS!

NOW Pangborn offers you *Automation!*



For fabricators using flat steel, coils, cut lengths—Pangborn Rotoblast® Descaling Machines offer *straight line* operation. One feed through descaler, oiler, slitter and stacker!



Here's How You Benefit!

- *You cut costs by using hot rolled unpickled steel.*
- *You speed production.*
- *You reduce labor costs.*
- *You eliminate problem of acid fumes and acid disposal.*
- *You use minimum floor space.*

For full details on automation for fabricators, write for Bulletin Number 224 to Pangborn Corporation, 3900 Pangborn Blvd., Hagerstown, Maryland.

Manufacturers of Blast Cleaning and Dust Control Equipment.

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BLAST CLEANS CHEAPER

Rotoblast Blastmaster® & Continuous-Flo Barrel

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R B & W FASTENER BRIEFS

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

Technical-ities

By John S. Davey

Selecting the right grade of bolt

With few exceptions, the true function of a bolt is to clamp members together, and not to act as an axle or fulcrum. The residual tension set up in the bolt keeps joints tight.

There's rarely need for costly alloy steel fasteners—not when 3 physical grades of steel can satisfy most "clamping" applications.

SAE grade 1 offers 55,000 psi minimum tensile strength; grade 2, 68,000 psi; and grade 5, approx. 120,000 psi.

The first is used for fasteners which are stress-relief annealed to increase ductility. The next provides low carbon fasteners with a bright finish. The last goes into high-carbon, heat treated black fasteners identifiable by three radial dashes on the head.

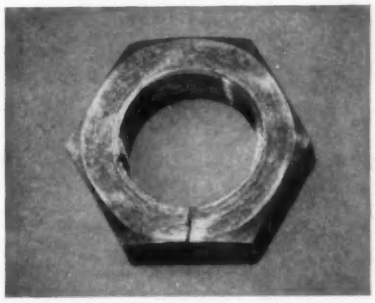
SOME SUGGESTIONS

In terms of holding power, the stronger bolts and cap screws can cost you less than the cheaper bright ones. For example, either a ⅝" with three radial dashes or a ¾" bright cap screw can be used for a safe working load of 20,000 pounds. But being smaller, the high strength one costs less. However, if the same diameter is desirable, then fewer bolt holes need be made and faster assembly achieved when a product is designed to make use of high strength bolts.

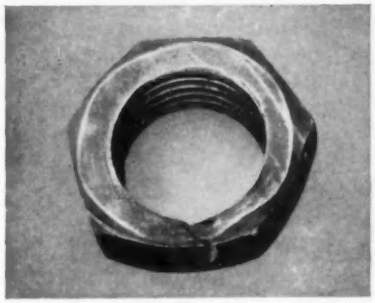
In short, for more pounds of clamping effort per dollar, use high strength fasteners; for more pieces per dollar, use the lesser grades.

Cold Punched Nuts add to safety factor

NUTS dilate when tightened on a bolt. They also adjust plastically to distribute the load over many threads. Since nuts are overdesigned to be stronger than the bolt, these stresses can be disregarded for all practical purposes.



How a defect in hex bar caused split in nut machined from it.



Drift punch had to distort cold punched nut severely, far beyond its yield point before it cracked.

There are times, however, when nuts with optimum assurance against service failure are desired. In such cases, it pays to consider use of RB&W cold punched nuts.

These nuts are punched at right angles to the metal's flow lines . . . same direction as stress encountered in service. No unrelieved stresses are set up. The initial punching automatically reveals any defects. Repunching, an RB&W development, then not only trues up the hole for clean, concentric threads, but also serves as a drift punch test, automatically checking the soundness of these safest of nuts.

For help in applying standard fasteners to assure more assembly strength and less assembly time, feel free to call in an RB&W man. Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, N.Y.

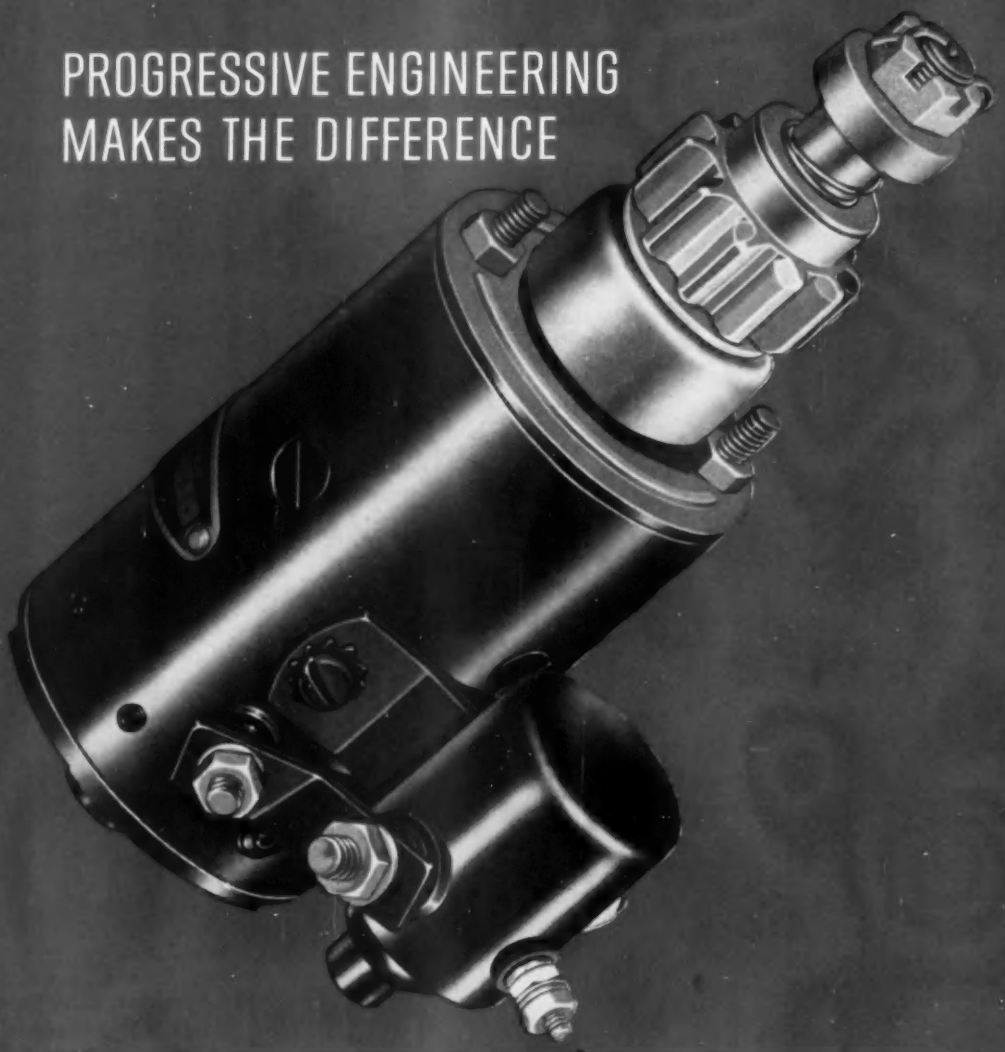
Plants at: Port Chester, N.Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional offices at: Ardmore, (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

One-piece fastener better than two

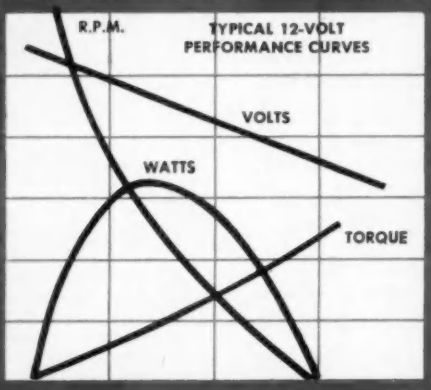
One particular oil filter used to be fastened with stud and cap sleeve made by screw machine. This was only until RB&W pointed out that a one-piece fastener could be formed easily on a cold header. The advantages gained are obvious. The single fastener *cost* less, and took *less time* to assemble.

RB&W makes a tremendous variety of strong, uniform standard fasteners to improve assembled metal products. If any of these don't fill a particular need, perhaps an RB&W "special" can be developed that will.

PROGRESSIVE ENGINEERING MAKES THE DIFFERENCE



TYPICAL SPECIFICATIONS	MODEL 1113501	MODEL 1113551
VOLTS	6	12
FRAME DIAMETER (INCHES)	3	3
FRAME LENGTH (INCHES)	4.30	4.42
MOUNTED LENGTH (INCHES)	5.25	5.37
APPROXIMATE WEIGHT (POUNDS)	6.5	6.5



DELCO-REMY DEVELOPS A NEW LINE OF CRANKING MOTORS FOR OUTBOARDS AND OTHER APPLICATIONS

A new series of Delco-Remy cranking motors, with many new design features, is now available for outboards, garden tractors, power mowers and other similar applications.

With a frame diameter of only 3 inches, an overall length of slightly over 5 inches when mounted, and a weight of about 6½ pounds, the powerful new motors will crank one-cylinder engines up to 15 H.P., two-cylinder engines up to 35 H.P., and four-cylinder engines of even higher horsepower.

These four-pole, four-field motors, designed for both 6-volt and 12-volt systems, may be powered by standard Delco batteries.

Available now for original equipment applications, the new motors can be supplied with or without automatic drives and solenoid switches to meet varying requirements. They are yet another example of Delco-Remy leadership in electrical equipment "Wherever Wheels Turn or Propellers Spin." Manufacturers of engines and power equipment are invited to write directly to Delco-Remy for complete information and engineering assistance on the application of these units.

DELCO-REMY • DIVISION OF GENERAL MOTORS • ANDERSON, INDIANA

GM GENERAL MOTORS

GENERAL MOTORS LEADS THE WAY STARTING WITH

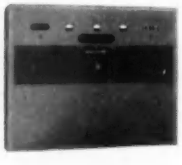
Delco-Remy

ELECTRICAL SYSTEMS

Hardened areas show darker at ends of rocker arm.

for accurate selective hardening of this rocker arm

...using a Lindberg 50 KW High Frequency Unit



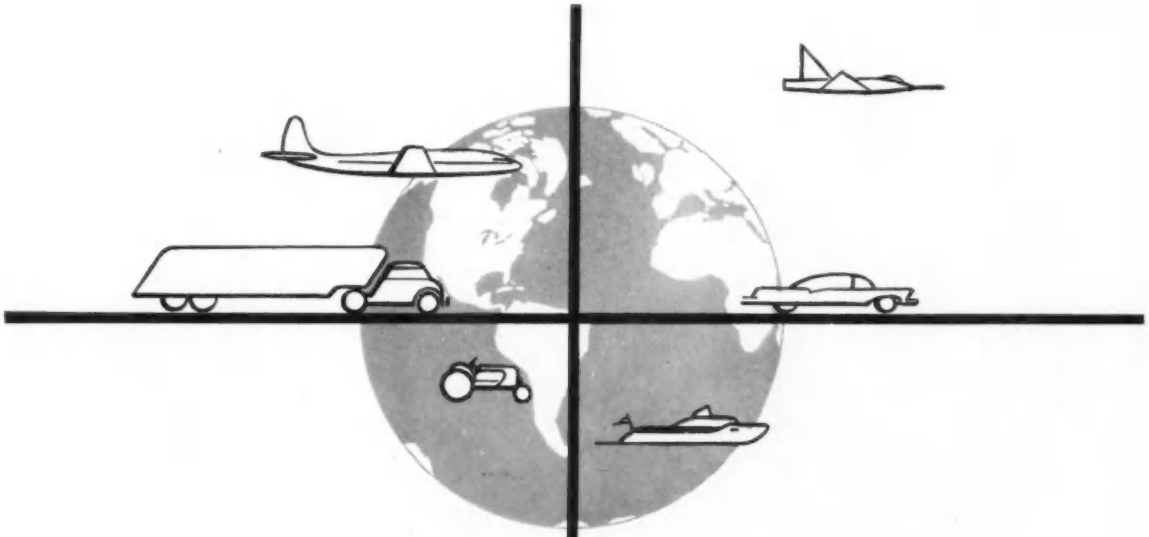
In Detroit, a leading manufacturer of prestige autos increased production of rocker arms 300% by switching to a Lindberg 50 kw high frequency unit with a new work fixture. Production is now 1550 per hour . . . with no rejects due to unit failure.

Selective hardening of these pearlitic malleable iron rocker arms provides wear resistance from valves and push rods. A sharp cutoff of the hardness is necessary because the center hole must be kept soft for further machining.

Lindberg high frequency units give continuous 24 hour a day operation with a maximum of dependability. If you have an induction heating application, you'd do well to talk things over with a Lindberg engineer.

LINDBERG **HIGH FREQUENCY DIVISION**

Lindberg Engineering Company • 2491 West Hubbard Street • Chicago 12, Illinois



AUTO-LITE | Serves Industry

with more than 400 products of the highest quality

Whether it be intricate die-castings, finely drawn magnet wire, electrical equipment for the automotive industry or any one of hundreds of other products . . . it is of the highest quality when it comes from Auto-Lite. This reputation for quality in 28 plants from Coast to Coast is maintained through central engineering control and is reflected in the public acceptance of the name Auto-Lite . . . and in the world-wide establishment of Auto-Lite service facilities.

THE ELECTRIC AUTO-LITE COMPANY
TOLEDO 1, OHIO

AUTO-LITE

Double-Disc Brakes Are Safer Brakes . . . *Here's Why . . .*

Each Ausco "Double-Disc" Brake is really two brakes within one housing. The primary disc and outer housing make one brake; the secondary disc and inner housing, another. Both brakes use the same actuating and self-energizing systems.

1 The finned housings are of aluminum and have a large surface area to dissipate heat rapidly and enable the brake to run cool. Even the heat generated by repeated panic stops does not distort or warp Double-Disc Brakes—or cause "fade" as is the case with conventional brakes. Ausco Brakes are safer brakes.

2 Double-Disc Brakes *automatically* stay in adjustment. Thus, pedal height is constant and braking is uniform. During the life of the brake, the adjuster (2) maintains proper clearance between the lining on the discs and the bearing surfaces. These brakes are therefore *always* effective. Stops are smooth, fast, without dangerous swerving or grabbing.

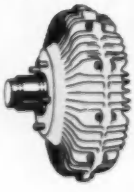
3 The Double-Disc Brake is hydraulically actuated. Braking action is started by pressure on the foot pedal acting through hydraulic fluid to move the annular piston (3). This piston forces the two actuating discs apart. Contact is made between the brake lining and the friction areas. Then the momentum of the car rotates the primary disc in relation to the secondary disc and the Auto Specialties self-energization principle goes into operation.

4 The outer surfaces of the discs carry segments of heavy-duty organic brake lining. 100% of the lining contacts the friction surfaces of the housings. Ausco Brakes have a large area of braking surface, work at lower pressures, and have longer lining life. Therefore, you stop surer, safer, smoother with Auto Specialties Double-Disc Brakes.

5 Auto Specialties' ball-and-ramp construction is the heart of the self-energization principle. The car's momentum causes the balls to roll up the ramps. This further separates the discs, forcing the lining tighter against the bearing surfaces. The greater the momentum, the greater the braking power. Self-energization and pedal pressure each supply half the total braking force. Pedal pressure is, therefore, light. Ausco Disc Brakes require no costly external booster system.

6 Mounting plates are attached to the front spindles and to rear axle housing. This is the stationary element of the Auto Specialties Double-Disc Brake and it absorbs all the torque. The flange mates with a groove on the inner housing to make the brake splash-proof. Auto Specialties Brakes give you better, safer braking under all road and weather conditions.

Auto Specialties Mfg. Company offers this brake with the full knowledge that it has been proved superior and fully meets the requirements of modern driving.



AUTO SPECIALTIES MFG. CO., INC.

SAINT JOSEPH, MICHIGAN

Plants also at Benton Harbor and Hartford, Mich., and Windsor, Ont., Canada.

Manufacturing for the automotive and farm machinery industry since 1908.

Watson Bros. ...one of the world's largest...adds 65 Fuller ROADRANGER® Transmissions to Expanding Fleet

Performance of 720 Fuller Transmissions in service prompts selection of semi-automatic units.

Today, the Watson Bros. Transportation Co., Inc., of Omaha, Nebraska, is rated as fourth largest common freight carrier operation in the United States . . . with 2400 units transporting 2,200,000 shipments annually over 60,000,000 miles.

Watson Bros. has just added 65 new modern tractor units, including:

40 West Coast International diesels equipped with Fuller 10-speed R-95-C Semi-Automatic ROADRANGER Transmissions,

15 Diamond T's putting horsepower to work through Fuller R-950-C Semi-Automatic ROADRANGER Transmissions, and a fleet of

10 R-195 Internationals equipped with Fuller 8-speed R-46 Semi-Automatic ROADRANGER Transmissions.

The performance of 720 Fuller Transmissions already in service for the pioneer Omaha common carrier was a prime reason for specifying Fuller Transmissions in their new equipment.

L. E. Erlewine, Superintendent of Maintenance for Watson Bros. since 1932, puts it this way: "The design of the ROADRANGER allows us to operate tandem-drive axles in both 50-foot and 55-foot states. Because of the ROADRANGER design we get more traction, resulting in safer operation. We need no chains on ice, and pull away from rigs using chains on the same grade. The performance of the semi-automatic ROADRANGER *adds up* to longer engine life, easier shifting, faster average speeds and greater fuel economy."

Fuller Transmissions make shifting fast and easy . . . and let the driver select the ratio he needs at the *right* time to meet every varying condition of time, traffic and terrain.

FULLER MANUFACTURING COMPANY
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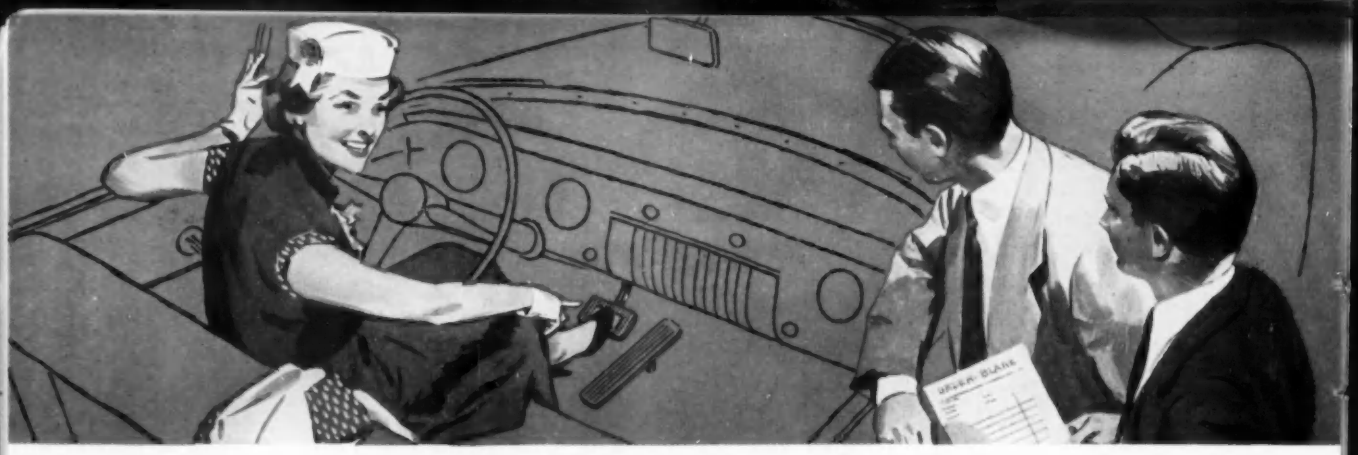

BENDIX POWER BRAKES ARE A PERFORMANCE-PROVEN SALES FEATURE

Bendix POWER BRAKES

First in the field - now standard of the industry!

The first practical power brake to be put on the market was developed and produced by Bendix. Today Bendix* Power Brakes are specified by practically every car manufacturer in the industry.

This industry-wide acceptance of the most revolutionary development in braking since Bendix four-wheel brakes is convincing evidence of Bendix foresight in research and engineering. And the fact that today more Bendix Power Brakes are in use than all other makes combined demonstrates conclusively the ability of Bendix to *produce* as well as to *plan ahead* for the industry's requirements.

Available in low pedal or high pedal designs to meet individual manufacturers' requirements, Bendix Power Brakes are a potent source of customer good will from the first mile to trade-in time.

BENDIX PRODUCTS DIVISION SOUTH BEND INDIANA

Export Sales and Service: Bendix International Division, 205 East 42nd Street, New York 17, N. Y.

*REG. U. S. PAT. OFF.

BRAKES • POWER STEERING • POWER BRAKING
• CONSTANT VELOCITY UNIVERSAL JOINTS
• HYDRAULIC REMOTE CONTROLS

Bendix Products Division

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High Spots of This Issue

★ Development and Design of Powermatic Transmission

Offered on 1956 Chevrolet medium and heavy-duty trucks, the new Powermatic transmission incorporates a number of interesting features. This article reviews the behind-the-scenes planning that went into the design of the drive. Page 48.

★ Forge Shop Instrumentation Reduces Rejects

Outfitted with a multiplicity of furnaces of all types, the Ford Canton, O., forge plant turns out some 80 different forgings for cars and tractors. Highlighted here is the extensive use made of instrumentation in the unit. Page 50.

★ Production Methods for Chevrolet Chassis Frames

No visitor to the Chevrolet stamping and frame plant near Flint, Mich., can fail to be impressed by the unique manufacturing methods in evidence. The author takes the reader on a graphic tour of the diverse facilities. See Page 54.

★ 19,000 Engines Per Month Produced by Wisconsin

Typical example of simple and practical automation applied to effect cost savings is the new plant of Wisconsin Motor Corp. at Milwaukee. Machines and techniques used to turn out seven basic engine models are described. See Page 66.

★ Brussels Automobile Show

Traditionally a good market for vehicle manufacturers, Belgium drew 82 makes of cars and 94 truck producers to its Brussels Show last month. This on-the-spot report pinpoints and pictures the newest lines and equipment shown. Page 70.

★ 34 New Product Items And Other High Spots, Such As:

Brazing jet stator blades; pilot injection *vs.* cetane numbers; rear axle housing flange production; Canadian aircraft industry; National Motor Boat Show; power steering usage; and adjustable fifth wheel.

Complete Table of Contents, Page 3
Automotive and Aviation News, Page 33

What's Ahead in Steel Service

Many new products and service facilities have been added at Ryerson during the past few months. Many more are in prospect for '56. Here's a review and a look ahead:

NEW STEELS—Three new Ryerson leaded alloys—Rycut 20, Rycut 40 and Rycut 50, were introduced during the past year. Additional sizes of these amazingly fast-cutting alloys have recently been added to our stocks—further additions are in store. Leaded plates, available only at Ryerson, have just been introduced and these New E-Z-Cut plates soon will be on hand in larger tonnages. Other recent additions to Ryerson stocks: Stainless plates and sheets in extra large sizes, welded pump-cylinder tubing, mansard pattern siding in stainless, galvanized and carbon steel, 8615 alloy steel plates for case hardening applications.

NEW SERVICE FACILITIES—Ryerson service facilities are never completed—modernization and expansion go on continuously. A few 1955-56 examples: a brand new Connecticut plant, additional facilities doubling stock and service capacity at Boston, a 30% increase in facilities at Buffalo, new cut-to-length lines at New York and Boston, greatly augmented shearing equipment at Chicago, more plant area at Los Angeles, Detroit and Spokane.

NEW QUALITY PROTECTION—Now, in 1956, still more stringent quality controls are going into effect—giving you added assurance of predictable steel performance every time. And these new controls supplement an existing program of quality checks and counter checks already considered exceptional throughout the metal-working industry.

STEPPED-UP DELIVERIES—Even under the pressure of current demand, a high per cent of all regular orders for steel from stock are shipped within 24 hours—practically all within 48 hours. With expanded facilities we confidently expect to do even better in 1956!

You have helped to make 1955 another year of great progress for Ryerson. We believe we can best show our appreciation by continuing to improve our ability to serve you in the year ahead.

RYERSON STEEL

In stock: Bars, structurals, plates, sheets & strip, tubing, alloys, stainless, reinforcing, machinery & tools, etc.

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • WALLINGFORD, CONN. • PHILADELPHIA • CHARLOTTE, N. C. • CINCINNATI CLEVELAND • DETROIT • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Vol. 114, No. 4 **February 15, 1956**

GM 1955 Net Over $1 Billion; Sales Hit $12.4 Billion Total

Capturing the honor of being the first industrial corporation in history to attain net earnings of over $1 billion in any one year, General Motors Corp. in 1955 tallied a record net income of $1.189 billion on sales of $12.443 billion. The preliminary figures were disclosed by Harlow H. Curtice, GM president, at the Miami, Fla., opening of the GM Motorama early this month.

Noting that General Motors' share of the passenger car market last year amounted to 50.8 per cent of the total, Mr. Curtice pointed out that the sales record was achieved despite a decline in defense orders. These accounted for only seven per cent of total sales in 1955, compared with 14 per cent in 1954.

Previous records for employment and payrolls were also shattered by General Motors last year. Its worldwide average number of hourly and salaried workers rose to 624,000 persons who earned a total of $3.127 billion.

Continental Motors Reports $2.5 Million Net For Year

Continental Motors Corp. had net earnings of $2.5 million on sales totaling $145.4 million for the fiscal year ended Oct. 31. In the previous fiscal year, sales amounted to $182 million and net earnings $4.5 million.

Chrysler Schedules Basic Body For All Lines But the Imperial

Chrysler is reported to be planning one basic body structure for its entire line of cars, except the Imperial, next year. This would consist of a common shell so far as A, B, and C posts are concerned, but considerable differences in appearance and dimensions would be possible among the various lines through the use of individual fenders, hoods, quarter panels, deck lids, and possibly even roof lines.

The program would offer substantial savings in design costs and yet retain individuality for each line of cars. Doors, for example, could be of the same overall dimensions, but outer sheet metal configurations could vary considerably.

TRAVELING GLASS SHOWCASE FOR MERCURY CRUISER

Shown above is a special glass-sided trailer now on a 900-mile run to Omaha from Cleveland carrying the Mercury XM-Turnpike Cruiser (see AI, Jan. 15, p. 35) on a coast-to-coast tour. The special Van-O-Rama has picture windows on either side which measure 20 ft long and six ft, six in. high. Drawn by a Ford C-700 truck, the special van was built by Fruehauf Trailer Co. at an estimated cost of approximately $50,000.

Expansion Program Set For Pontiac This Year

Pontiac is the first General Motors division to announce plans for expansion under the corporation's $1 billion capital expenditures program for 1956. At least four plants in Pontiac will be enlarged to house new equipment, including the grey iron foundry, the main assembly plant, and the axle and differential plants. A new 180,000 sq ft waste disposal plant also will be constructed to speed removal of waste from metal plating operations.

Ford To Start Building New Car Line Next Year

First official clue to the introduction of Ford's new car line comes from R. H. Sullivan, Ford Motor Co. vice-president and group executive. Mr. Sullivan said recently that Ford's Lima, O., engine plant, now under construction, will be producing engines for a new car by September, 1957. His statement thus confirms previous reports which indicated that production on the new car would probably start late in 1957 as a 1958 model.

The new car will fall between Mercury and Lincoln to further Ford's across-the-board competition with General Motors. The Lima engine plant will have a capacity of about 3000 engines a day.

Mr. Sullivan did not indicate, however, whether the plant will turn out all engines exclusively for the forthcoming car. The plant will employ about 4000 persons when completed and will be extensively automated.

News of the AUTOMOTIVE

AIRCOOLED WISCONSIN

The new Wisconsin Model BKN is a companion to the recently introduced Model ACN single-cylinder, heavy-duty aircooled engine. Rated from 3.2 to 6.8 hp, in a speed range of 1600 to 3600 rpm, the BKN has a bore of 2 7/8 in. bore, stroke of 2 3/4 in., and a total displacement of 17.8 cu in.

Thompson Expansion Program To Run $32.5 Million in '56

Thompson Products, Inc., will spend a record $32.5 million this year on capital improvements. A substantial part of that amount is earmarked for new equipment for its Michigan plant and its Valve Div. operations. About $14 million of the total is for new projects, while a similar amount is for carryover projects from 1955.

Chrysler Reveals More Details Of New Automatic Transmission

Chrysler has released further details about its new three-speed automatic transmission (see AI, Feb. 1, p. 35) now being offered on the Imperial as optional extra cost equipment. The new three-speed gear box provides three forward ratios of 2.45 to 1; 1.45 to 1, and 1 to 1. At stall speed the converter has a torque ratio of 2.7 to 1, and overall torque ratio of the transmission is 6.6 to 1.

Automatic downshifts to second range at speeds below 70 mph and to first range below 25 mph are possible by depressing the accelerator pedal to the floor. The downshift also can be made manually for operation on hills and long grades by pressing the first-range button of the push-button control. When the "low" button is depressed at below 25 mph, the transmission will stay in the low braking range regardless of car or engine speeds.

An automatic safety feature shifts the transmission into neutral if the reverse button is accidentally depressed at speeds of about 12 mph or more. Another interesting feature of the new transmission is that even when the second-range button is held down manually, the transmission will upshift to high range at a predetermined point to prevent over-speeding of the engine.

In the normal drive position, first gear torque reaction is absorbed by an overrunning clutch, which releases when the second gear brake band develops sufficient pressure to hold second gear torque reaction. This design reportedly gives an extremely smooth 1-2 shift.

Another interesting feature of the transmission is a provision for free-wheeling when deceleration reaches a speed of three to four mph in drive range. This prevents any downshift shock of a shift into low gear when coming to a stop. The free-wheeling feature does not function, however, when the "low" button is depressed for braking.

Sale of Interests in Ranco Gives AMC First Net Profit

Although American Motors Corp. showed another operating loss in its new fiscal year starting last October, a special non-recurring item actually gave the company its first net profit. AMC had an operating loss of $4.62 million with no tax recovery during the first fiscal quarter ended Dec. 31, but sale of its interests in Ranco, Inc., last November for $7.14 million brought the corporation's net profit to $2.51 million for the quarter.

During the same quarter a year earlier, AMC had a loss of $10.87 million. A tax recovery of $5.41 million reduced the net loss to $5.46 million.

AMC reports that it has been operating at a profit since the beginning of December. Sales for the October-December quarter totaled $99.18 million, compared with $77.16 million in the like three months of 1954.

Car Producers Studying Transmission Relocation

Automobile manufacturers are showing interest in relocating the transmission to eliminate the front seat tunnel. Considerable experimentation is going on with transmissions affixed to the differential carrier and both units rigidly attached to the chassis as sprung members.

With the unit thus mounted, the tunnel could be lowered or eliminated because it would not require clearance for up and down driveshaft movement. Such a construction would require some kind of swinging axle arrangement for independent rear wheel suspension.

Torsion Bar Suspension Expected On More Cars

More torsion bar suspensions for automobiles are on the way. One of the major car manufacturers is planning to offer torsion bar suspension on all of its lines next year. It is not clear yet, however, whether a leveling device such as now used by Packard will be incorporated.

AND AVIATION INDUSTRIES

Packard Enlists Women's Views in Sales Campaign

Packard Clipper Div. is starting a campaign to interest women in the engineering, as well as the styling, features of its automobiles, and plans to spend more than $1 million to get feminine reactions. Since women are continuing to influence car sales more than ever before, Packard feels that a program aimed directly at them will yield important information for use in future merchandising programs.

Basic objective of the 45-day program is to generate greater interest among women in engineering features and innovations exclusive on the luxury models. The program is being carried out through newspaper, radio, and television media.

Simmonds Fuel Injection Units Ordered for M-48 Tank Engines

Simmonds Aerocessories, Inc., has announced receipt of substantial production orders for its SU fuel injection systems from Continental Motors Corp., Muskegon, Michigan. These fuel injection systems will be used on the Continental 1790-8 gasoline engine for the Army's M-48 tank.

This is said to be the first large-scale production installation of fuel injection for gasoline engines to power surface vehicles, although Simmonds has previously manufactured smaller quantities of these same systems for various ordnance equipment.

Ford Adjusts Prices Of Cars To Dealers

First evidence of manufacturers' price reductions on 1956 models is the adjustments Ford Div. made to its dealers in January on certain invoice charges. Ford denies that it has reduced wholesale prices as such, but the net effect of reductions in certain invoice charges is lower acquisition cost to the dealer. The resulting wider margin can either be retained or used for larger trade-in allowances to stimulate business, since suggested retail prices were not reduced.

Principal objective of the cuts in invoice charges reportedly was to make Ford dealers more competitive price-wise with Chevrolet. The reductions are said to be in the neighborhood of $25 a car.

A dealer deposit of $15 has been eliminated, and per-car charges for national advertising also have been reduced substantially to a maximum of $10. Several accessories and optional equipment items also have been adjusted up and down to bring them more closely in line with the Chevrolet schedule.

Another price concession made by Ford is installation of a new incentive bonus system. Retroactive to the first of this year, it provides year-end rebates ranging from $7.50 to $17.50 on each car sold and depending on each dealer's size and market potential.

Ford also has agreed to reimburse dealers for two-tone paint jobs done in the dealer's shop. Prices have been set at $35 for two-toning a Fairlane and $20 for the Mainline and Customline models.

Ford also has informed the dealers that optional engines of greater horsepower will be made available soon for the entire passenger car line. It is reported that Mainline and Customline models will be available with engines of about 200 hp and station wagons and Fairlane models will have a top of about 225 hp.

FRENCH SPORTSTER INTRODUCED AT MUSEUM SHOWING

The Gregoire sports car, which made its first public appearance at the Henry Ford Museum sports car show in Dearborn, Mich., is built on a cast aluminum frame with a wheelbase of 94.5 in. It is powered by a flat, supercharged, four-cylinder engine with a displacement of 133.51 cu in. and top output of 130 bhp at 4500 rpm.

Mercury 260-Hp Engine Offered as an Option

Mercury has joined other car manufacturers in offering as an option a modified engine with higher horsepower. The optional 260-hp Mercury engine includes two four-barrel carburetors, high-compression cylinder heads, and high-lift camshafts. Compression ratio is 9.75 to 1.

Appearance of Four Headlamps Not Seen Blocked by Few Bans

Although some automobile companies are said to be preparing to introduce four headlamps on 1957 models, there are still several states which have to take legislative action to make the lamps legal. Six states now have laws banning more than two headlamps, and several other states may require either legislative or administrative action before they can be installed.

Dual sets of headlamps have been the source of considerable controversy in the industry. Apparently, however, all differences have been worked out, and the industry now has agreed to seek state approval where necessary. First company expected to introduce four headlamps will be Cadillac on its El Dorado Brougham.

News of the AUTOMOTIVE

Ford Aluminum Plant To Make Transmission, Engine Parts

Further information about Ford's new aluminum foundry, to be located adjacent to the reduction plant being constructed by Reynolds Metals Co. at Listerhill, Ala., shows the plant will contain about 250,000 sq ft of space. It will include a laboratory for further studies of aluminum with regard to automotive applications.

Ford is negotiating for purchase of a 130-acre site near the Reynolds plant and plans to start construction this summer. Under an agreement between Ford and Reynolds, the latter will supply Ford with more than 640 million lb of molten aluminum a year. Ford will use the metal to produce automatic transmission and engine parts in permanent mold and die casting operations.

Packard-Clipper Div. Unable To Meet Transmission Demand

Packard-Clipper Div. reports it is unable to meet the demand for its pushbutton transmissions. Introduced on 1956 models, the unit is now being installed on only 86 per cent of total Packard production. The company gave no other details except to say that it expected the shortage to continue through February.

MPA Meeting and Conference To Be Held in Cleveland, O.

The Metal Powder Association will hold its 12th annual meeting and 1956 Metal Powder Show in Cleveland, O., at the Hotel Cleveland from April 10 to 12, 1956. It will deal with all aspects of the field of powder metallurgy, with particular emphasis on the manufacture of structural parts from metal powders, self-lubricating bearings, metal powder filters and friction materials, as well as iron powder electronic cores and ferrites.

The show will display the latest developments of the powder suppliers, parts manufacturers and press, furnace and other equipment manufacturers. Additional information is available from the Metal Powder Association, 420 Lexington Ave., New York 17, N. Y.

1956 Passenger Car Production

As reported direct to Automotive Industries by the car factories

	January 1956	January* 1955
Hudson	4,669	2,999
Nash	10,330	4,472
Total—American Motors	14,999	7,471
Chrysler	13,275	17,470
De Soto	11,079	13,469
Dodge	21,322	32,797
Plymouth	54,155	64,046
Total—Chrysler Motors	99,831	127,782
Continental	373	
Ford	127,783	143,761
Lincoln	5,751	2,906
Mercury	22,937	32,383
Total—Ford Motors	156,844	179,050
Buick	67,095	62,427
Cadillac	14,196	14,135
Chevrolet	151,678	154,517
Oldsmobile	50,166	48,416
Pontiac	38,236	48,000
Total—General Motors	321,371	327,495
Packard	3,793	4,993
Studebaker	14,352	11,796
Total—S-P Corp.	18,145	16,789
Total—All Makes	611,190	658,567*

*—Does not include 107 Willys Motors car production.

Profits of Budd Co. Rose Over 100 Per Cent in 1955

The Budd Co. earned $13,790,578 on sales of $316,572,778 during 1955, according to unaudited year-end figures. Profits for 1954 were $6,292,424 on sales of $244,013,101.

Automotive sales increased 36 per cent during 1955. Reporting on operations of the Continental Diamond Fibre Div., which was acquired in mid-year, the company said that sales for the second half had risen to $10,732,067 and profits to $479,844.

Allison Div. Turns Out 100,000th Plane Engine

Allison Div. last month (Jan.) turned out its 100,000th aircraft engine. The engine was a T-56 turboprop, which the division has been producing for the military.

Allison developed its first engine—a 650-hp piston unit—for the Navy in 1931, and received its first order from the Army in 1939. During World War II, Allison built more than 70,000 engines for the Army alone.

ACS Meeting to Feature An Automotive Symposium

Special feature of the forthcoming national meeting of the American Chemical Society will be a symposium on "The Impact of the Automobile on the Chemical Economy." The ACS meeting in its entirety will run from April 8 to 13 at the Statler-Hilton Hotel in Dallas, Tex.

Speakers at the aforementioned symposium will include Joseph Geschelin, AI Detroit Editor. He has chosen as his topic the subject "What's Ahead in Motor Car Registrations?" Other speakers on the program—centered around the general theme of chemical consumption in the manufacture and operation of automotive vehicles—will cover such subjects as: tires, glass, paint, plastics, fuels, etc.

Car Companies Look Closer At Monocoque Construction

Monocoque construction is receiving serious attention from automotive designers. Thinking in Detroit is that the industry eventually will swing over to that design on a wide scale.

Biggest problem is tremendous cost of changing over facilities in all assembly plants of large companies. Lincoln reportedly will tool for monocoque construction in its new plant at Novi, Mich., scheduled to be ready for production of 1958 models.

Shakeproof Div. Split Into Two New Sections

Shakeproof Div. of Illinois Tool Works, which manufactures fastening devices for the automotive, appliance, and other industries, has been reorganized into two divisions. They include separate engineering staffs, special field representatives, and separate manufacturing facilities.

The new Fastex Div. will develop special plastic and stamped metal fasteners and allied small parts. Engineering facilities of the new division will also be available to manufacturers of various types of components, sub-assemblies and finished products to aid them in achieving economies of size, material, or assembly time.

AND AVIATION INDUSTRIES

TRANSISTOR ORGANISM

A physicist at Delco Radio Div. of General Motors Corp. studies the growth of a large crystal of germanium in the center of the quartz housing. The crystal will eventually be cut into wafers to become the heart of a Delco Hi-Power transistor. These transistors replace some vacuum tubes in the new Delco radio available in the Chevrolet Corvette.

Studebaker Half-Ton Trucks To Offer New Differential

Studebaker-Packard Corp.'s new non-slip differential (see AI, Feb. 1, p. 52) will be offered as optional original equipment on all of the Studebaker half-ton truck models in the Transtar line beginning in March. It will carry a factory-installed price of $26.52.

Ford To Build A-Reactor For Display At Rotunda

The automobile industry's continued interest in nuclear power is pointed up in the announcement that Ford has asked the Atomic Energy Commission for a license to build a live atomic reactor. Designed to demonstrate the peaceful uses of the atom, the reactor will be the central attraction of an "atomic amphitheater" in the Ford Rotunda.

The Ford reactor will be similar to one the U. S. displayed at the International Conference on Peaceful Uses of Atomic Energy in Geneva last summer. Other exhibits will deal with the peacetime potentials of the atom.

AI TABLOID

On the heels of its abandonment of plans to set up a U. S. assembly operation (see AI, Feb. 1, p. 39), Volkswagen is planning a sharp increase in its exports of cars to this country. Total figure may reach 60,000 units in 1956.

* * *

Cummins Engine Co., Inc., has announced an immediate 21 per cent increase in engine production over current levels.

* * *

Fruehauf Trailer Co. will build a new 100,000 sq ft truck-trailer manufacturing plant in the Atlanta, Ga., area during 1956.

* * *

Curtiss-Wright Corp. has acquired Turbomotor Associates . . . Eclipse Counterbore Co. has acquired all of the major assets of Wadell Tools.

* * *

Temco Aircraft Corp. is designing and building a small, two-place, high-performance jet trainer.

* * *

Solar Aircraft Co. has received a contract to build a number of Jupiter gas turbine portable compressor packs for the Air Force.

* * *

Standard Screw Co. has purchased Ravenna Metal Products Corp. . . . Air Logistics Corp. has bought Aircraft Maintenance Systems, Inc.

* * *

Goodyear Tire & Rubber Co. has developed a watermelon-shaped rubber tank for the bulk transportation and storage of fuels and other liquids.

* * *

Cadmet Corp. has expanded its production facilities with a building addition . . . Northwest Chemical Co. has completed a major expansion of its Detroit home office and plant facilities.

Long Mfg. Co., Ltd., is expanding its plant facilities in Oakville, Ont., by 25,600 sq ft. . . . Stran-Steel Corp. has announced a $2 million expansion of its manufacturing facilities at Terre Haute, Ind.

* * *

Joy Mfg. Co. has set up a new Turbo-Dynamics Div. at Buffalo, N. Y. . . . Lockheed Aircraft Corp. is establishing a Special Projects Engineering Div. at Marietta, Ga. . . . Allison Co. has become a division of American Chain & Cable Co., Inc.

* * *

Naugatuck Chemical Div. of U. S. Rubber Co. will build a new chemical plant to manufacture Kralastic plastic materials near Baton Rouge, La. . . . Union Carbide & Carbon Corp. has announced plans to build a polyethylene plant in Brazil.

* * *

Kaiser Aluminum & Chemical Corp. is entering the aluminum food container business with two plants—one on the West Coast and the other in the Mid-West.

* * *

Boeing Airplane Co. has received $303 million in orders from the Air Force for long-range B-52 jet bombers.

* * *

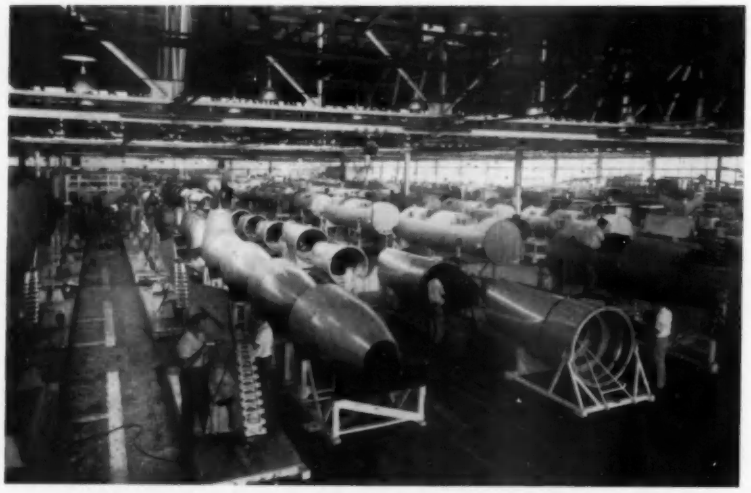
Thermoid Co. will launch production at an automotive brake lining and parts plant in Mexico shortly . . . Automotive engineer and designer Luis Jauregui has initiated production of plastic automobile bodies in Mexico on a small scale.

* * *

Huber-Warco Co. has announced two new motor graders featuring a torque converter and full power shift transmission—the 140-hp 7-D and the 100-hp 6-D.

(*Turn to page* 174, *please*)

News of the AUTOMOTIVE



ADHESIVE BONDING USED IN MATADOR MANUFACTURE

The TM-61 Martin Matador tactical missile is manufactured in seven major parts—wing, nose, aft-tail, center section, fin and stabilizer section, and instrumentation—which are completely interchangeable. Much of the Matador's wing and tail, as well as some interior structure, is composed of an aluminum honeycomb material to which the covering skin is bound by an adhesive material. The missile is powered by an Allison J-33 jet engine and is launched with the aid of a rocket booster.

Dodge Ambulance Model Made for Municipal Use

Dodge Div. of Chrysler Corp. has announced production of a special ambulance model. Designed for multi-purpose municipal use, it is basically a modified Dodge Sierra four-door station wagon. It is powered by a Super Red Ram 230-hp V-8 engine.

More Safety Developments Are Under Study at Ford

Ford is working on several additional developments to provide safety for automobile passengers in the event of an accident. Benson Ford, vice-president and group director of the Mercury and Special Products Div., says the company is working on:

Shock-absorber-mounted instrument panels; windshield glass that will absorb more energy before failing; non-skid brakes; front-end design which will absorb more energy than present types; stronger roofs for roll-over protection, and special locks to prevent the "jack-knifing" of folding seats during a crash. The non-skid brake apparently is based on the "feathering" principle used in some aircraft to release brakes momentarily just short of the locking point.

Four-Door Convertible Model Being Readied By One Maker

Now that the convertible hardtop has gone to four doors, a similar development reportedly will come in the soft-top convertible. One of the Big Three is working on a four-door soft-top for its highest priced line. It conceivably will be followed later in the less expensive makes.

Diamonds To Be Discussed At ASTE Meeting In March

Discussions on synthetic diamonds and their possible future uses for industrial tools will highlight the 1956 Exposition and Convention of the American Society of Tool Engineers. To be held at the International Amphitheater in Chicago from March 19-23, this year's session will feature 13 technical papers.

Scintilla Develops Ignition For Heavy-Duty Applications

Scintilla Div. of Bendix Aviation Corp., has developed a new heavy-duty ignition system for multi-cylinder engines. Key part of the new ignition system—a magneto master breaker—is said to need adjustment only once a year.

So-called "picture windows" in various parts of the system provide quick service inspection at all times. The new unit was specially designed for the large six to 16-cylinder engines used for oil pipe lines, city power and water stations, aluminum production, and other heavy-duty jobs.

The new system combines Bendix's new LC magneto for high compression engines and the Hi-V (high voltage) transformer coil. Besides providing a hot spark with minimum spark plug erosion, it reportedly solves a problem in starting engines of 1000 to 4000 or higher horsepower by delivering ample voltage at normal cranking speeds.

AMC Gets Contract For Seaplane Work

A subcontract for engineering services for the B-57 SeaMaster seaplane has been granted to American Motors Corp. by Glenn L. Martin Co. Work on the contract will be carried out by AMC's Special Products Div., housed in the Detroit plant formerly occupied by Hudson.

International Automobile Show Will Have International Theme

Running from April 28 to May 6 at the Coliseum in New York City, the 1956 International Automobile Show will occupy 88,000 sq ft of exhibit space. More than 150 automobiles of all types, plus motorcycles, automotive accessories, fuels, and various supplies will be shown.

Successor to the International Motor Sports Show, the exposition will have an international flavor with exhibits from England, France, Italy, Germany, and other countries as well as the U. S. The preliminary list of American exhibitors includes Ford, Chrysler, and Studebaker-Packard.

AND AVIATION INDUSTRIES

ASBE Elects Grebe Head; Other Officers Chosen

Henry C. Grebe, director of the Body Engineering Office, Ford Engineering Staff, Ford Motor Co., has been elected president of the American Society of Body Engineers for the year 1956.

The incoming board is composed of the following: vice-president, Carl Hedeen; secretary, Leonard Buccellata; treasurer, Ira Gosling; and the following directors—I. Louis Carron, Russ Cooper, Harold Holderness, Frank LeGrove, Roy Peckham, and Wes Ravell.

Rubber Gas Tanks For Cars Studied

The increasing use of rubber in automobiles is pointed up in a report from U. S. Rubber Co. On a 1956 model, for example, the company notes there may be as many as 550 different items made of rubber.

U. S. Rubber is now working on rubber gasoline tanks for cars which could be shaped to fit inside of the open "wells" of a fender. Elimination of the gas tank from its present location would give automobile stylists more freedom in designing the rear end, the company feels.

Lincoln Engineer Expresses Views on "Car of the Future"

While the "automobile of the future" is not a new subject for discussion, Harley F. Copp, director of the Lincoln car engineering office, recently took a practical look at what can be expected in the future. Basing his views on past customer preferences. Mr. Copp reflected on some of the current speculations and indicated which of them might become realities.

Speaking strictly from an engineering standpoint, Mr. Copp believes fuel injection, for example, appears imminent, but expresses skepticism about gas turbine engines. Further development of the turbine engine, he thinks, will depend a great deal on whether metals can be found to withstand operating temperatures up to 1600 F. Widespread use of rear-engine mounts also will depend on whether stronger and lighter materials can be found for engines and transmissions to maintain present car weight distribution.

Customer preferences for more comfort and easier car handling will have a big impact on stepping up the development of radical new devices, Mr. Copp observed. Automatic devices for steering a car into a limited parking space, automatic mechanisms for preventing a car from skidding, and devices for providing a level ride under all load conditions will become necessities with increased performance, he said.

Customer preferences, Mr. Copp states, indicate that the car of the future will have less chrome, be much lower, have a greater wheelbase, and visibility will be enhanced greatly by more glass to the point of an all-glass roof. Many of the developments are now on the drawing boards, but when they will become widely accepted will depend on the motoring public itself.

RECORD-SMASHING TOTALS RUNG UP IN AN EPIC YEAR

1955 U. S. Motor Vehicle Factory Sales*

	Passenger Cars	Trucks	Buses	Totals 1955	Totals 1954
January	635,513	89,676	190	725,379	551,134
February	677,705	67,061	176	744,942	534,145
March	791,280	102,992	325	894,597	633,054
April	753,434	127,887	519	881,840	631,769
May	721,139	127,941	313	849,393	568,611
June	647,658	119,215	309	767,182	598,876
July	658,736	108,589	296	768,621	530,415
August	620,610	95,119	434	716,163	521,450
September	467,845	91,894	223	559,962	389,942
October	505,177	95,610	469	601,256	287,705
November	745,993	114,448	359	860,800	567,785
December	695,043	103,556	410	799,009	708,185
Total 12 Months	7,920,133	1,244,988	4,023	9,169,144	6,601,071

1955 U. S. Motor Truck Factory Sales by G.V.W.*

	5,000 lb. and less	5,001-10,000	10,001-14,000	14,001-16,000	16,001-19,500	19,501-26,000	Over 26,000	Total
January	42,396	15,055	4,059	16,489	4,743	3,007	3,927	89,676
February	30,036	11,277	2,645	11,911	3,875	3,095	4,222	67,061
March	48,816	18,275	4,155	19,176	4,364	3,241	4,965	102,992
April	61,365	22,178	4,834	23,779	5,416	4,231	6,084	127,887
May	60,287	21,721	5,149	24,420	6,408	3,734	6,222	127,941
June	52,720	20,753	4,105	22,877	7,709	4,393	6,658	119,215
July	48,363	18,813	3,711	22,164	6,753	4,221	5,564	109,589
August	41,482	16,015	3,208	19,467	5,958	3,479	5,519	95,119
September	46,826	15,645	3,125	14,490	4,311	2,728	4,767	91,894
October	50,625	17,695	3,770	12,299	3,787	2,381	5,053	95,610
November	56,761	18,753	4,309	19,984	6,001	3,773	4,867	114,448
December	48,177	16,391	3,835	18,699	6,466	5,143	6,845	103,556
Total 12 Months	585,856	212,571	48,905	225,755	65,719	43,413	64,789	1,244,988

* Automobile Manufacturers Association.

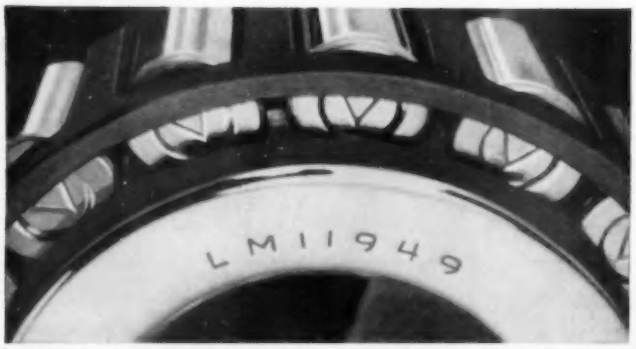
Borg-Warner Building To Go Up in Chicago

A $13 million, 20-story structure to be called the Borg-Warner Building will be built in Chicago on the site where the Pullman Building is currently located. Borg-Warner Corp. will occupy the top four floors of the building, which is scheduled for completion by late 1957.

Erratum

On page 104 of the Jan. 15 issue of AUTOMOTIVE INDUSTRIES, it was erroneously stated that E. A. Kehoe had been promoted to chief engineer of Rochester Products Div. of General Motors Corp. Mr. Elmer Olson is actually chief engineer, and Mr. Kehoe occupies the newly created position of assistant chief engineer. W. G. Maher succeeds him as director of quality control.

Continued on Page 94

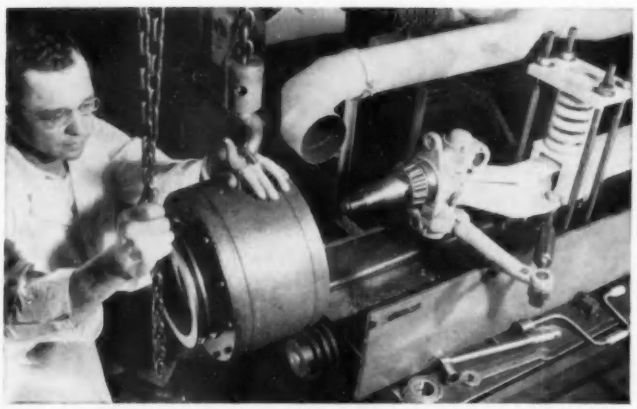


LM11949 ON THIS BEARING CONE, and LM11910 on the cup, identify it as a new low-cost, space-saving tapered roller bearing for front wheels. But with the trade-mark "Timken" also on the bearing, the number has a history of extra quality and service, tells you the bearing was made by the originator of the new design.

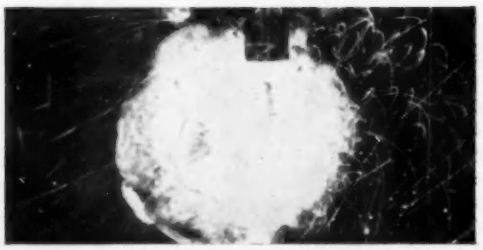
The number with a history

SHE USES THIS MACHINE to measure bore size and roundness of Timken® bearing cones in ten-thousandths of an inch. Cones are then sorted into sub-sizes by O.D. and matched with rollers that have also been sub-sized. It's this precision manufacture that pays off in longer life, less maintenance.

WE CASE-HARDEN EVERY RACE AND ROLLER in the world's largest battery of case-carburizing furnaces. We make bearing parts hard on the outside to resist wear, tough on the inside to take shock. It's another reason Timken bearings are number-one for value in your car's moving parts—the vital zone.



WE MAKE SPECIAL TESTS to help automobile manufacturers solve basic design problems. In this simulated service test, we run front-axle assemblies under maximum loads. It tests the bearings under operating loads, compares seals and lubricants, shows customers how to get longer bearing life.



WE MAKE OUR OWN STEEL—to control quality from the start. Shown here: a sample for lab analysis. We're America's only bearing manufacturer that makes its own steel. It's another reason for specifying "Timken" with the bearing number. And for *full* value, always use a Timken bearing cup with a Timken bearing cone. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN is number 1 for VALUE

TRADE-MARK REG. U. S. PAT. OFF.

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ▯ AND THRUST →▯← LOADS OR ANY COMBINATION →✳←

Men in the News

Square D Co.—F. W. Magin and A. G. Patterson have become chairman of the board and president, respectively.

Chrysler Corp.—**F. W. Misch** has been named finance officer to succeed the late **George W. Troost.**

Warner Automotive Parts Div., Borg-Warner Corp. — **Spencer H. Mieras** has been appointed president and general manager.

E. W. Bliss Co.—**George Perrault, Jr.,** was made a vice-president.

Chrysler Div., Chrysler Corp.—**E. E. Angerman** was appointed executive development coordinator.

Ford Motor Co., Special Products Div.—**L. C. Mecklenburg** has been made parts and accessories sales manager; **Malcolm R. Fuller,** business management manager, and **William H. Mitchell,** manager of the Administrative Dept.

Boeing Airplane Co.—**Lysle Wood** was named vice-president and general manager of the Pilotless Aircraft Div.; **J. B. Connelly,** vice-president and general manager of the Transport Div.; and **C. B. Gracey,** vice-president and general manager of the Seattle Div.

Industrial Wire Cloth Products Corp.—**Douglas Agren** is now president, and **Richard T. Karr** has become a vice-president.

Stran-Steel Corp.—**C. V. Blackburn** has been appointed vice-president of sales.

A. O. Smith Corp.—**D. W. Sherman** was named executive staff engineer; **James F. Jones,** assistant manager of the automotive products group; and **R. G. Harrop., Jr.,** general credit manager.

General Motors Corp., Central Foundry Div.—**Leslie L. Shafer** was appointed assistant sales manager.

Ford Motor Co.—James O. Wright has been appointed assistant general manager of the Ford Div., and Earl G. Ward succeeds him as director of purchasing.

Norton Co.—**Edwin C. Evans** was elected a director; **Howard J. Daly,** vice-president in charge of crude abrasive plants; **William H. Perks,** assistant treasurer; and **Curtis M. Clark,** assistant secretary.

Bendix Aviation Corp.—**Howard K. Morgan** has been appointed director of commercial aviation systems.

Westinghouse Electric Corp., Aviation Gas Turbine Div. — James D. Redding was named headquarters sales manager.

Detroit Diesel Engine Div., General Motors Corp.—**D. J. Clymer** has been appointed advertising manager.

Clark Equipment Co., Construction Machinery Div.—**W. F. Rowley** is now purchasing agent.

Continental Motors Corp.—**Henry W. Vandeven** has been elected to the board of directors.

Hooker Electrochemical Co. — **Thomas E. Moffitt** has been elected executive vice-president, and **R. Wolcott Hooker** has been elected senior vice-president.

Pacific Airmotive Corp.—**John W. Myers** has been elected chairman of the board and **B. Allison Gillies,** vice-chairman.

McCulloch Corp.—**Joseph L. Hegener** has been named vice-president and treasurer; **J. D. Cavanaugh,** secretary and assistant treasurer; and **William H. McCarthy,** controller.

Solar Aircraft Co.—Edmund T. Price was named chairman of the board, and Herbert Kunzel was made president.

E. F. Houghton & Co., Metalworking Div.—**Sidney J. Barber** was named manager of the Metalworking Products Dept., and **Claude G. Wall** was made supervisor of metalworking research.

(*Turn to page* 168, *please*)

Necrology

George W. Troost, 53, vice-president in charge of finance for Chrysler Corp., died Jan. 24, at Detroit, Mich.

Henry Sahlin, 62, founder of Sahlin Engineering Co., Inc., and inventor of the "Iron Hand," died recently, at Birmingham, Mich.

Frederick V. Bott, 60, assistant director of the General Motors Fleet Section, died Jan. 19, at New York, N. Y.

Howard W. Lobel, 37, supervisor of the Gear Dept. of Kearney & Trecker Corp., died Jan. 18, at Greenfield, Wis.

Frederick P. Cuthbert, 62, aviation pioneer and retired general manager of Al-Fin Div. of Fairchild Engine & Airplane Corp., died Jan. 23, at Boothbay Harbor, Me.

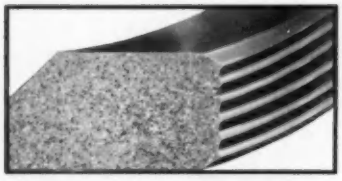
Henry Schreck, 75, leading Diesel engine designer, died Jan. 29, at New York, N. Y.

Arthur C. Keller, 57, assistant comptroller and credit manager of Libbey-Owens-Ford Glass Co., died Jan. 24, at Toledo, O.

George J. Kolowich, 58, controversial Detroit financier, died recently, at Detroit, Mich.

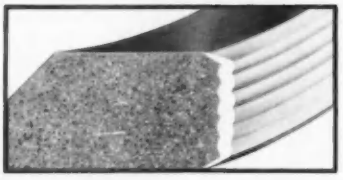
Sealed Power has a way with Chrome not duplicated by others

Here's how Sealed Power engineers have licked the heat, friction, abrasion, and corrosion caused by higher engine speeds in modern motors.



THE CASTING . . . For better bonding of the chrome face, Sealed Power developed a special chrome-alloy cast iron. Oil-carrying grooves are machined into the face of the casting for better lubrication.

THE PLATING . . . The chrome face is then electro-plated on the casting, to a thickness of not less than .004". Note that the oil-carrying grooves are still apparent. They are an important factor in the ring's success.



THE LAPPING . . . After plating, the ring is factory-lapped to a light-tight finish, which is equivalent to 300 to 500 miles of actual road wear. This expert lapping is the reason for the ring's quick seating.

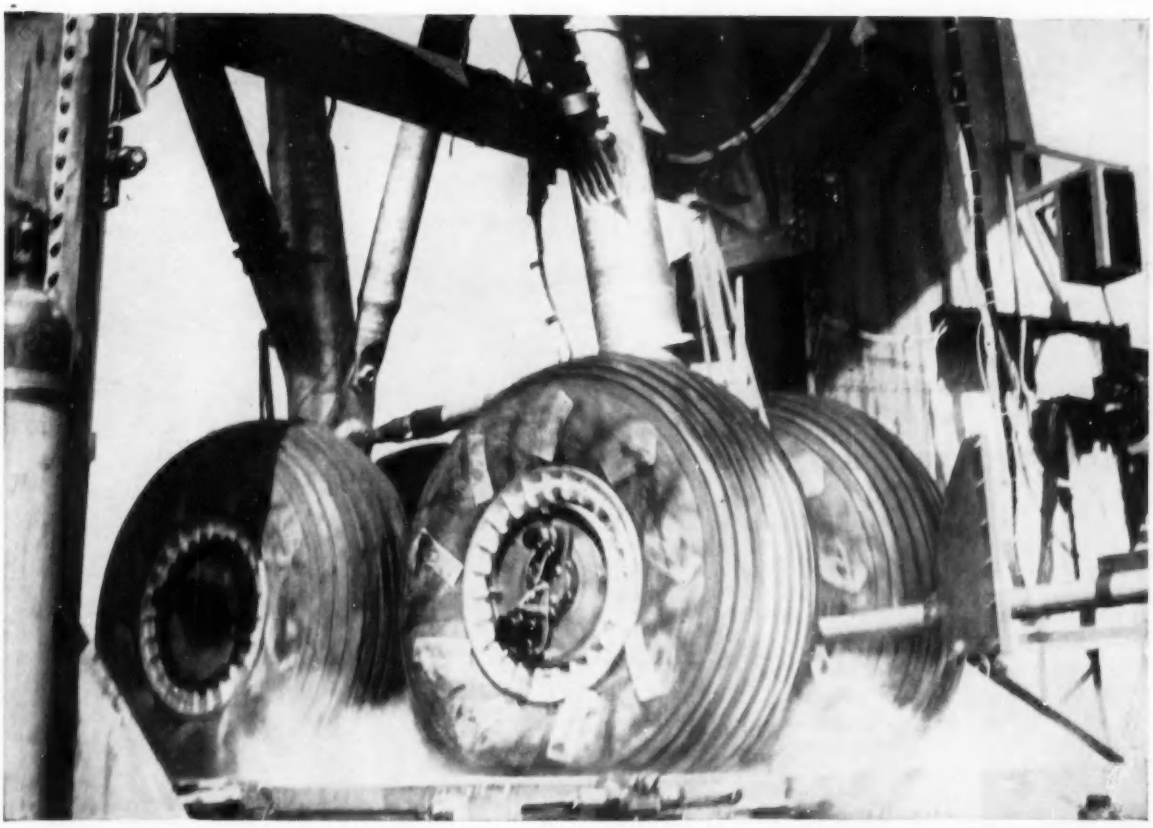
In cases where exceptionally hard service is demanded, Sealed Power's exclusive Cyclan ring iron may be used for top compression rings, with the chrome plating added as illustrated here. Whatever your chrome ring problem, you are invited to use Sealed Power's long years of successful experience.

SEALED POWER CORPORATION • MUSKEGON, MICHIGAN • ST. JOHN'S, MICHIGAN • ROCHESTER, INDIANA
DETROIT OFFICE • 5-164 GENERAL MOTORS BUILDING • PHONE TRINITY 1-3440

Sealed Power Piston Rings

PISTONS • CYLINDER SLEEVES

Leading Manufacturer of Automotive and Industrial Piston Rings since 1911
Largest Producer of Sealing Rings for Automatic Transmissions • Power Steering Units



On *TWA's* **SUPER-G** Lockheed Constellation's landing gear . . .

Elastic Stop® nuts pass this brutal drop test

Like a bladeless guillotine, this 40-foot-high Lockheed test stand hoists landing gear assemblies aloft, spins their wheels backward 100 miles an hour, and crashes them down on its concrete base. Tons of lead weights simulate the big plane the landing gear is designed to carry.

The Lockheed experiments are directed toward development of lighter, stronger landing gear. These new units in turn demand fasteners designed for maximum resistance to fatigue failure plus the utmost dependability in terms of rated tensile performance and resistance to loosening under severe vibration and extreme shock and impact loads. Among the planes to benefit from data already secured by these punishing tests is the new Lockheed Super G Constellation, already placed in service by TWA. The Super G Connie's landing gear is only one of the many structural sections of the new plane fastened with vibration-proof Elastic Stop nuts.

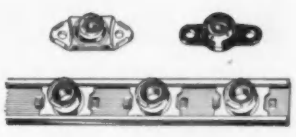
Elastic Stop nuts with their familiar red locking collars have been used on every new air frame developed during the last two decades. They have performed satisfactorily under the most unpredictable test conditions . . . under normal operating conditions . . . and throughout millions of hours of rugged combat service. You can rely on flight-tested Elastic Stop nuts!

ELASTIC STOP NUT CORPORATION OF AMERICA

Dept. N79-25 • 2330 Vauxhall Road • Union, N. J.

Red *Nylon* locking collars are standard on all ESNA fixed fasteners guaranteeing:

- vibration-proof locking
- thread sealing . . . no galling
- immediate identification
- adaptability to all shapes and sizes of aircraft fittings
- suitability to production line assembly methods
- extended reusability (ask for ESNA's high re-use Nylon Spec. #420).



How to detect and measure flange bending in gasketed joints

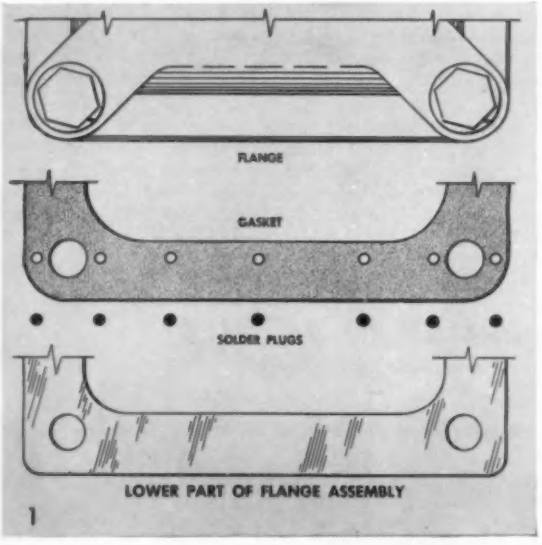
A surprisingly large percentage of gasket leaks is caused by almost undetectable bending or bowing that occurs between flange bolts, according to tests conducted at the Armstrong Research and Development Center.

Obviously, bending is most likely to be found where flanges are light, where bolts are widely spaced, or where bolting pressure is high. But it can also occur in heavy flanges, where bolts are not properly spaced.

Flange bending can cause leaks because it reduces the flange pressure on a gasket in the area midway between bolt holes and thus reduces gasket compression. Also, it may cause extrusion of the gasket near the bolts because of the concentrated pressure in these areas.

There are three qualitative ways and one quantitative way that an engineer can determine if flange bending is taking place.

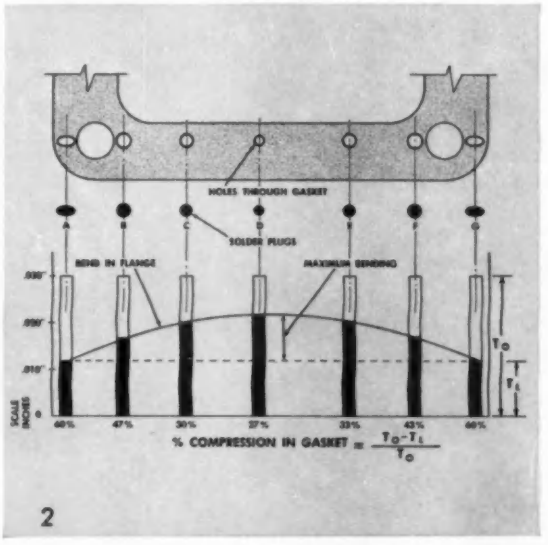
1) *Pinpoint the leakage.* If leaks originate at center points between bolts, there's good reason to believe that flange bending is the source of trouble.
2) *Look for localized extrusion.* Extrusion near bolts—and not at midway points—indicates that flange bending is present.
3) *Check for varying gasket adhesion.* Flange pressure is one of the factors causing gasket adhesion. Consequently, where pressure is greatest, greatest adhesion should occur. If upon opening a leaky joint the gasket is found to be sticking more around bolts than at center, flange bending probably is occurring.



1

TO QUANTITATIVELY MEASURE FLANGE PRESSURE or gasket compression at any particular point, a simple yet accurate "solder plug" test devised by Armstrong research engineers can be used.

Drill several holes about 1/32 inch in diameter through thickness of gasket to be tested. Insert in these holes cylinders or plugs of soft solder. (Fig. 1) The plugs should be thick enough so that when the flanges compress the gasket, the plugs will also be compressed. Put gasket with solder plugs into flange and tighten bolts to desired torque.



2

Open the flange and measure thickness of solder plugs. Each plug obviously will measure exactly the same as the compressed thickness of the gasket at the point where it was located.

The extent of flange bending can be shown graphically by charting the solder plug thicknesses. (Fig. 2) If too much bending occurs, gasket will be overcompressed around bolts and undercompressed between bolts.

The percentage of compression can be easily calculated by using the formula in Figure 2. With this information, it is possible to determine whether the gasket material is within its recommended range at specific locations on the flange. The load-compression curves for the gasket material in question may be used to estimate unit loads. But these are relative unit loads and not absolute values. In addition, picking unit loads from load compression curves is applicable only to the compressible gasket materials such as cork composition.

SEND FOR 24-PAGE GASKET DESIGN MANUAL

You'll find other useful information on the design and use of gaskets in the new Armstrong Gasket Design Manual. Write for your copy of this manual to Armstrong Cork Company, Industrial Division, 7102 Imperial Avenue, Lancaster, Penna. For information on all Armstrong Gasket Materials, see Sweet's product design file.

Armstrong
GASKET MATERIALS
. . . used wherever performance counts

60 second tour

shows it in a nutshell . . .

All-Inclusive Spring Service

COMPRESSION SPRINGS
Regular, Double

COMPRESSION SPRINGS
Special Shapes
Variable pitch

VOLUTE SPRINGS
Coned end

EXTENSION SPRINGS
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and Loops

EXTENSION SPRINGS
Swivel End
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POWER SPRINGS
Clock or Motor

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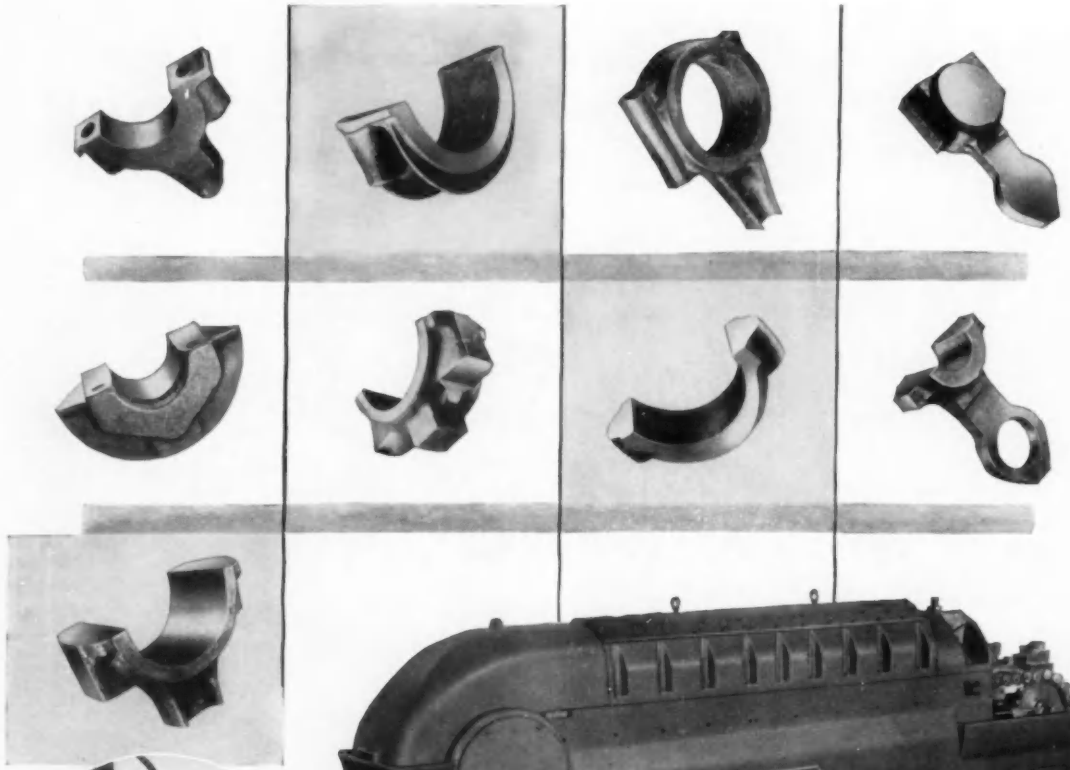

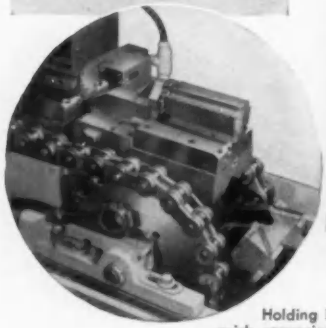

Holding Fixtures are designed for quick, convenient loading, with automatic clamping, unclamping and unloading.

Continuous Type Broaching Machine Built in Five Sizes

machining connecting rods and caps an opportunity for

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■ Surface Broaching is a modern machining method that in many cases shows reduced costs through higher production, finish to closer tolerance, and low tool maintenance costs. If you machine large quantities of duplicate parts we will be glad to work with you on the possibility of adopting Footburt Surface Broaching Machines. Send us blueprints and hourly production requirements for our recommendations.

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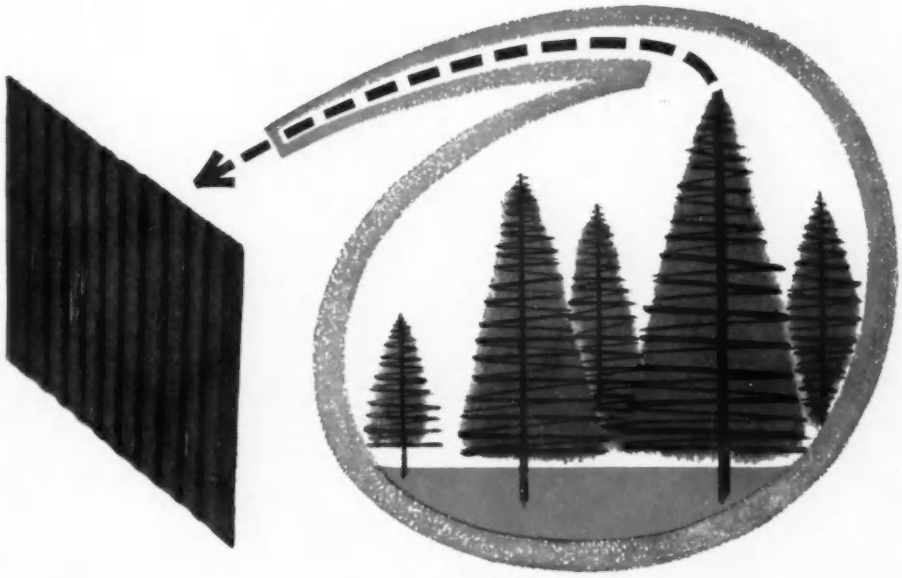
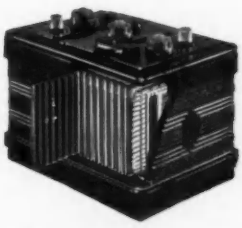
PIONEERS IN SURFACE BROACHING



NOW modern wood chemistry brings you better battery separators!

When you start with wood to make a good, low-cost battery separator, you retain all of wood's advantages. Then, when you apply Evans' newly developed chemical processes—using Evans' new production equipment – you get the *extras,* like high uniform porosity, extremely high acid resistance, superior wettability and permeability, low web thickness, outstanding mechanical strength in the battery, and resistance to abrasion and oxidization. Controlled swelling after insertion in the battery results in a tight element which resists vibration under every road condition.

If your battery manufacturer is not using Evanite® now, urge him to write for our latest research information. We'll be glad to ship him samples, too.



EVANS PRODUCTS COMPANY, Dept. P-2, Plymouth, Mich.—makers of the new Evanite high-performance, low-cost battery separator.

Plant: Coos Bay, Oregon. ***Sales Offices:*** Plymouth, Mich.; Coos Bay, Ore.; New York, N.Y.; Chicago, Ill.; Tampa, Fla.

EVANITE

is a registered trademark of Evans Products Company

EVANS PRODUCTS COMPANY also produces: bicycles and velocipedes; DF railroad loading equipment; truck and bus heaters and ventilating systems; and Evaneer fir plywood

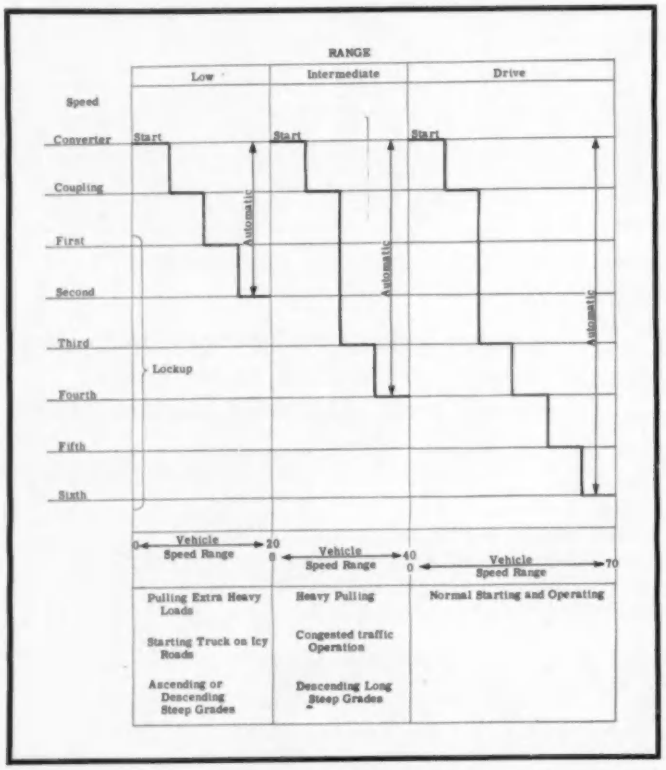
Development and Design

By H. O. Flynn
Chevrolet Motors Division
General Motors Corp.

POWERMATIC, an all new automatic transmission, was developed in cooperation with the Allison Division for the 1956 Chevrolet medium and heavy-duty trucks. The following objectives were drawn up to serve as the goal during the design and development stages of the new drive.

1. Increased vehicle mobility and flexibility under all conditions by—
(a) Applying engine horsepower effectively through well-chosen geared ratios.
(b) Full power shifts up and down to any gear ratio.
(c) Full automatic shifting with driver control of specific ratio ranges for specific operating conditions.
(d) Controlled downhill braking.
2. Improved vehicle fuel economy by—
(a) Low parasitic losses in transmission.
(b) Allowing the engine to operate in best rpm range for good economy.
(c) Allowing use of reduced N/V axle ratio for part throttle economy.
3. Improved vehicle durability and reliability by—
(a) Reduced clutch, drive line and axle maintenance.
(b) Eliminating band-type control elements.
(c) Designing the transmission in one unit with simple controls.
(d) Having no adjustments in transmission.
(e) Including an oil filter in the transmission.
4. Improved vehicle adaptability and usability by—
(a) Providing SAE power take-off openings on both sides of the transmission.
(b) Using the torque converter for all starts forward and reverse.

For maximum installation simplicity and adaptability it is quite apparent that a single package transmission is highly desirable. All the control valves and the valve body should be located where they are readily available for inspection and service. Since dirt is the greatest enemy of hydraulically controlled transmissions, a large replaceable filter unit is needed.



This chart shows uses of three ranges in relation to vehicle speed and operating conditions

The transmission shift control quadrant and the hand brake lever for the transmission mounted parking brake should be mounted directly on the transmission. In place of adjustable friction elements to time shifts, the control system should be so arranged that this timing function is all performed hydraulically, eliminating periodic adjustments to compensate for wear.

For purposes of illustration we have divided the early development program into four broad phases. Actually, of course, the development was typically continuous and had no clear dividing lines.

The first design attempted was, for economic reasons, kept as simple and small as possible. It could be summarized as follows: converter, three speeds forward, one reverse; manual shifts; no lockup, and air cooling.

Two major changes were incorporated to overcome the deficiencies of the first design. First, an automatically actuated lockup clutch was added. The second feature was an automatic shifting planetary "splitter" unit in front of the main gear set.

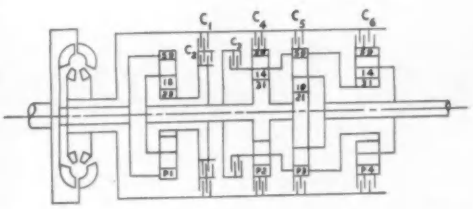
Phase II incorporated: converter and lock-up clutch; three geared ratios plus splitter; semi-automatic control, and liquid cooling.

The next significant step in the development was an all-out effort to improve downhill braking control. The working resulted in the addition of a hydraulic retarder, an independent, dynamic braking device.

This phase could be summarized as: converter and lock-up clutch; three gear ratios plus splitter; semi-automatic control; liquid cooling, and hydraulic retarder.

The finished product incorporated completely automatic controls, three specialized drive ranges and driver overcontrol for unusual driving situations. The finished product had converter and lock-up clutch; three geared ratios plus splitter; automatic controls; hydraulic retarder, and election of speed ranges by the driver.

(*Turn to page* 126, *please*)

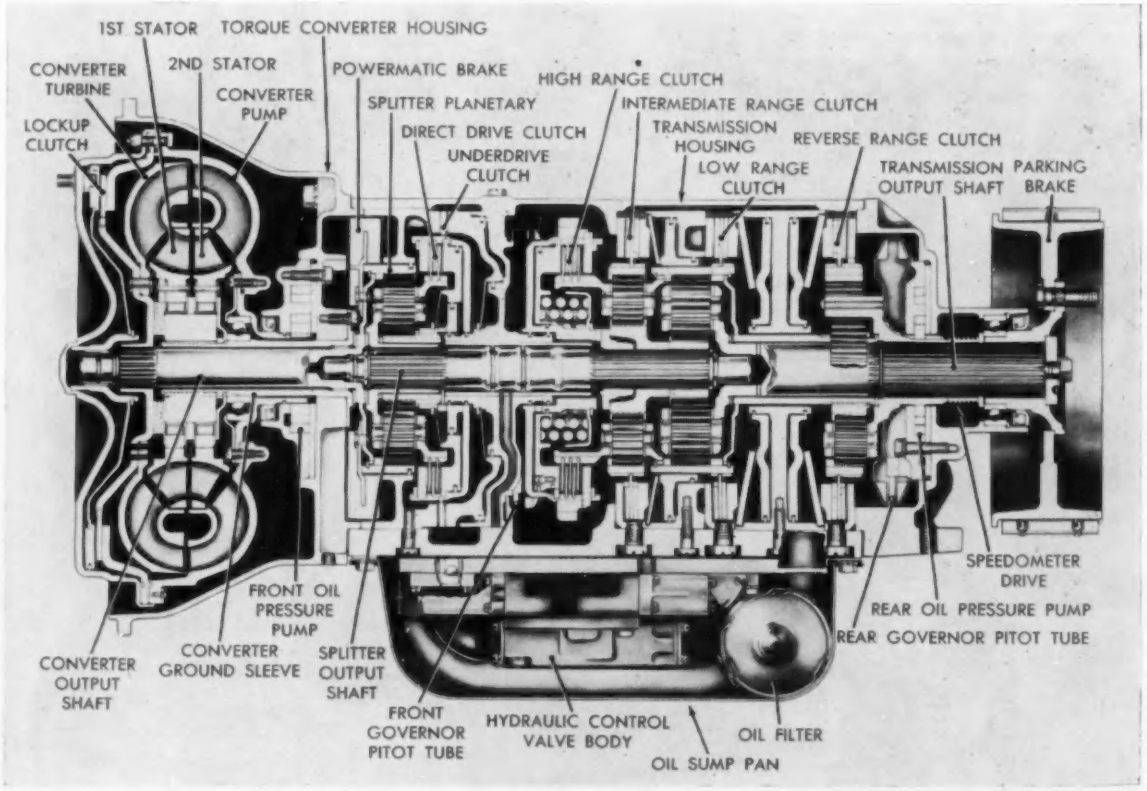


GEAR	C1	C2	C3	C4	C5	C6	RATIO
1st	X				X		5.294
2nd		X			X		3.810
3rd	X			X			2.691
4th		X		X			1.936
5th	X		X				1.390
6th		X	X				1.000
Rev. 1	X					X	-6.042
Rev. 2		X				X	-4.347
Neut.	X	■					---

Splitter Low
Splitter High
High
Intermediate
Low
Reverse

Gear and clutch schematic, including table of ratios and clutches in each gear

of the Powermatic Transmission



Sectional view of the new transmission designed for Chevrolet medium and heavy duty trucks

Forge Shop Instrumentation

Reduces Rejects Protects Equipment

SOME 80 different forgings for Fords, Lincolns, Mercurys and Ford tractors are made at the recently modernized Canton, O., forge plant of Ford Motor Co. In this large forge shop, rear axles, automatic transmission parts, universal joints and numerous other forgings are made from bar stock and shipped to various company plants. Serving the many forging presses, upsetters and hammers are a number of slot furnaces, forge furnaces, special furnaces, heat treating furnaces and furnaces for tool and die work. Instrumentation and automatic control are used extensively to protect the equipment and insure a low reject rate.

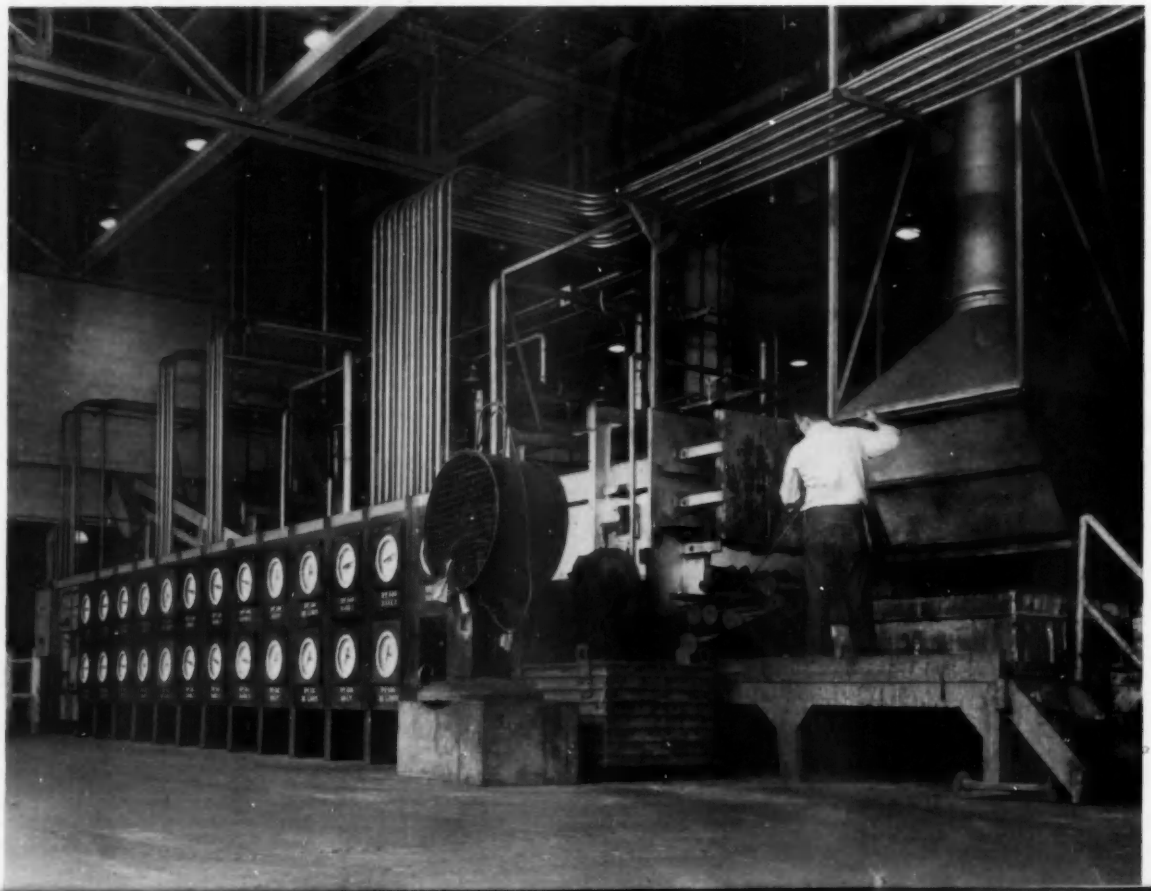
The natural gas-propane fired furnaces are equipped with automatic temperature control systems. In all, there are 102 furnaces in the plant, including 15 specially-designed, Ford high speed furnaces and 13 Surface Combustion furnaces.

Pneumatic control is used throughout the forge plant. Forge furnaces are equipped with narrow band throttling control. High speed furnaces utilize wide band throttling control. The tool and die furnaces employ pneumatic on-off control. Air in the fuel-air mixture to the burners is controlled in such a way that when the air is shut off, fuel is automatically cut off.

The instrument department watches over and cares for the plant's 300 control instruments. It also designs all of the control systems for the various furnaces. The control arrangement for slot furnaces highlights system design and installation from a cost saving standpoint.

Before the present degree of instrumentation was attained, slot furnaces were controlled manually and there was no indication of temperature. As a result,

Holcroft heat treating furnace in foreground used for treating automatic transmission parts to obtain proper machineability. Instrument panel board contains 25 electronic controllers which provide zone control for 10 furnaces.



there were occasions when the operator would leave the furnace for one reason or another and would neglect to turn the furnace down. Upon return (especially if he had been away long), he would find his furnace greatly overheated and the refractory dripping, thereby necessitating costly repairs.

The automatic temperature control system recently installed on these furnaces has virtually eliminated this occurrence.

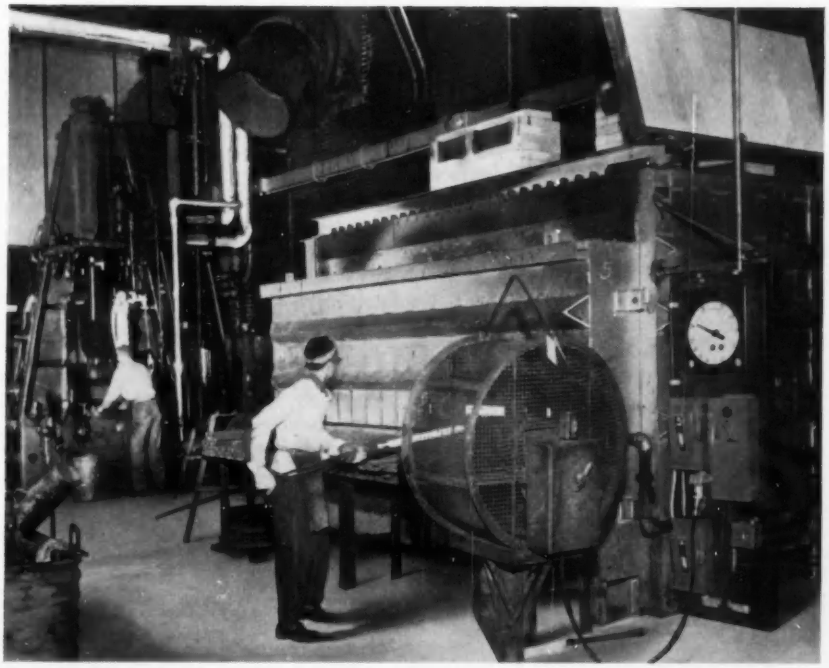
Push-button operating-idling temperature control of the furnace is obtained through the use of a three-way air solenoid system incorporated in the temperature control loop. The solenoid itself is operated by means of push buttons so that when the operator leaves his furnace, he need only depress the idling push button to place the furnace in a standby condition. Upon his return, he depresses another push button to bring the furnace back up to operating temperature.

This, coupled with the fact that the temperature of the furnace cannot rise above the set point of the control instrument, has abolished overheating of the refractory. Both the push-button arrangement and the temperature control system act to prevent the possibility of overheating and at the same time save on fuel consumption.

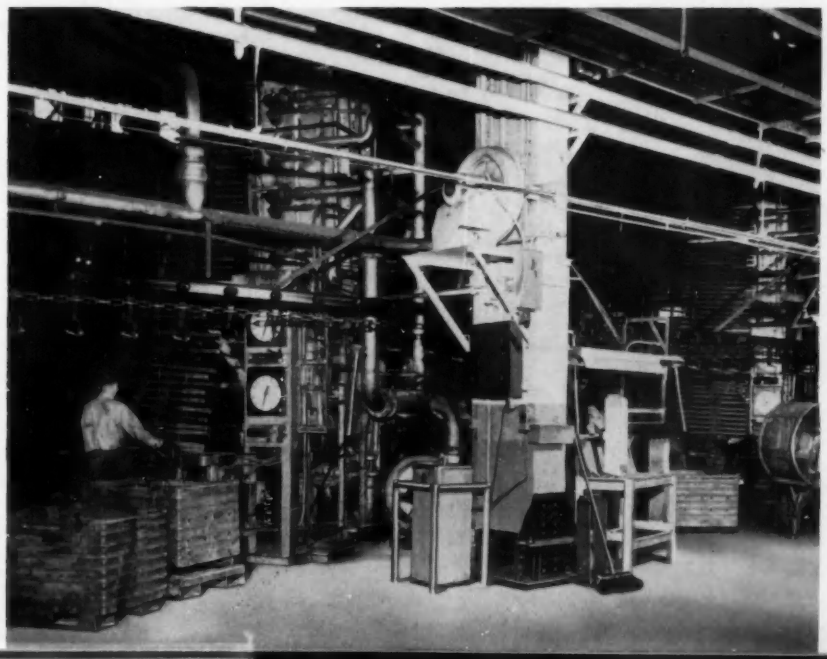
A unique reject arrangement has been installed on a number of billet heating furnaces which feed forging presses. With the furnace under manual operation, and without any means of measuring the temperature of billets delivered to the forging press, overheated billets would occasionally be delivered to the forging presses. To prevent overheated billets from being fed to the forging press operator, first step necessary is to measure the temperature of the billet as it is ejected from the furnace.

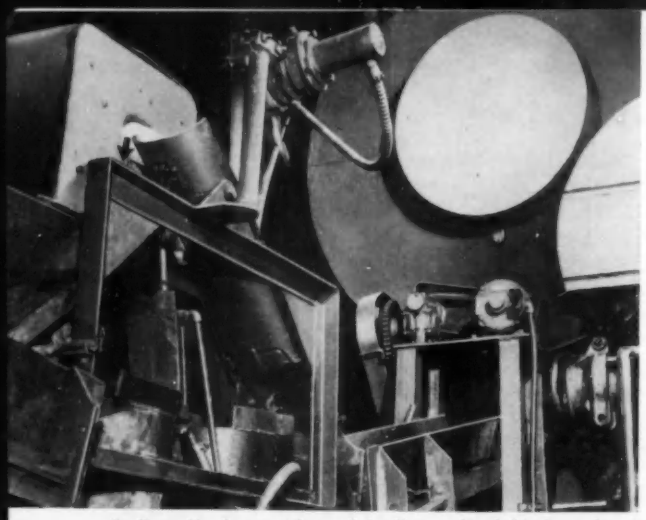
This is readily accomplished with a Radiamatic temperature detecting unit designed by Minneapolis-Honeywell. This unit senses the temperature of the billet by measuring the intensity of the heat radiating from it. The detecting unit is connected to an ElectroniK recording controller equipped with on-off control which

Slot furnace used to heat bar stock for forging hammer (on left) which forms universal joint spiders. Note electronic temperature control instrument, push buttons and panel at right.

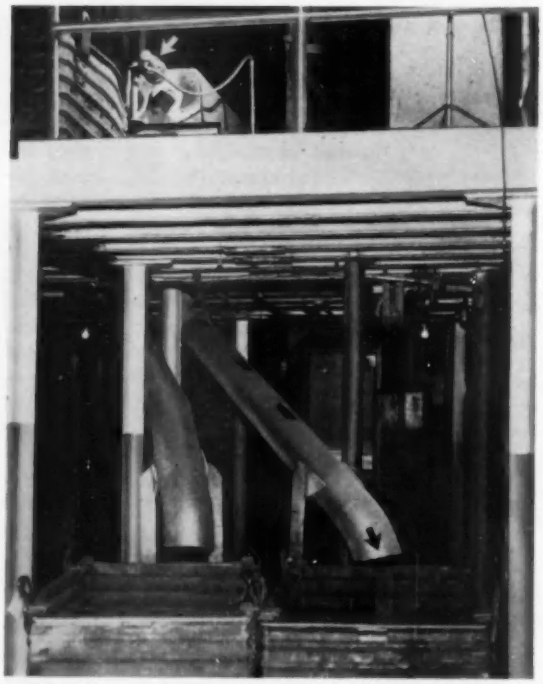


Special high speed, two zone furnace for heating rear axles. Horizontal conveyor carries axle to cooling and heat treat. To maintain correct forging temperature in each of the two zones, Brown Radiamatic radiation pyrometers are used. The detecting units are sighted on a closed end tube in each zone.





Radiamatic temperature detecting unit sighted on ingot emerging from furnace. Note chute and tilting mechanism. Reject movement shown by black arrows.



Overall view of billet heating furnace, reject mechanism, Radiamatic pyrometer unit, reject troughs and baskets. White arrow shows Radiamatic ingot temperature sensing unit. Black arrows show path of rejected ingots.

evaluates and acts on the signal sent from the detecting unit.

With the electronic controller set at the maximum allowable billet temperature limit, a control action is provided which operates whenever the actual temperature of any one billet emerging from the furnace is above the desired forging temperature. This control action is employed to trip the chute. The instrument control action functions through a time delay relay which holds the chute over just long enough for the billet to pass through it and on down the trough into the reject baskets.

Net operating result is that so long as billets are ejected at the correct forging temperatures, they are passed along to the forging press operator. Billets not at the correct temperature never reach him.

Rounding out the thorough use of automatic control in all phases of the forge plant operations where practical is the instrumentation used in the heat treating department. Here one grouping of 10 furnaces (comprising single-zone draw furnaces with high limit ElectroniK controllers for each) and three-zone solution heat treating furnaces (with one on-off ElectroniK controller for each zone) are governed by the 25 instruments on the panel board.

Temperatures in the individual zones of the solution heat treating furnaces and in the draw furnaces are measured by means of individual Hoskins Chromel Alumel thermocouples, in turn, connected to individual controllers on the panel board. Each controller provides an on-off control action which shuts the air supply off on the fuel-air mixture fed to the furnace in question. The system is so arranged that when the air is cut off, the fuel is automatically cut off at the same time. On all heat treating furnace controllers, the instrument charts are filed and retained for a three-month period.

Illustrative of the efficient manner with which instrument repairs are handled is the test panel shown in the illustration. Designed by instrument department personnel, the test panel features a speedy arrangement for checking the amplifiers from electronic potentiometric controllers. The circular chart controller shown on the test panel constitutes a test rig. It essentially comprises all necessary instrument components with the exception of an amplifier. This permits an amplifier from a production instrument to be connected to the test panel and thence to the test instrument, by permanent wiring. A check on the amplifier in question can then be made by permitting it to drive the test instrument. In this way, amplifier trouble is easily isolated and repaired amplifiers are readily checked.

Test panel for instrument repair shop, designed by instrument department personnel for forge plant.

Automatic Setup *for Brazing* Jet Stator Blades

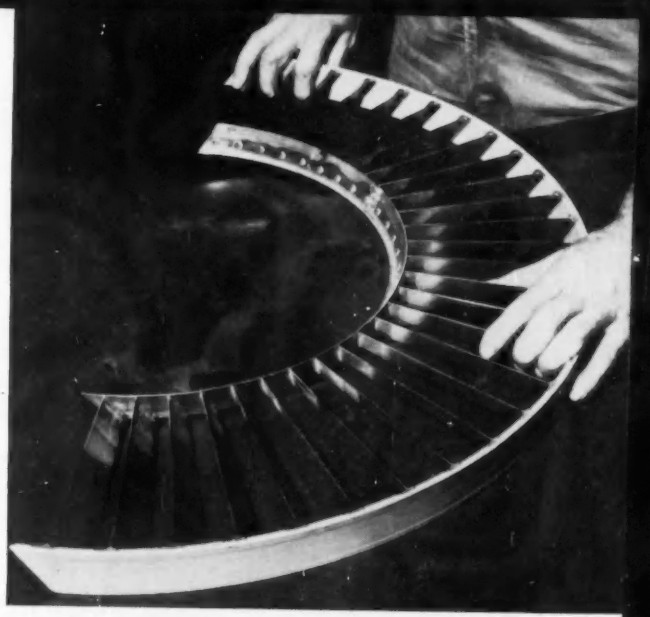


Fig. 1—Completed half-shroud, showing silver-brazed joints on the inner ends of the 28 blades

At the Allis-Chalmers Manufacturing Co. in Terre Haute, Ind., the use of automatic equipment for silver brazing jet blades to engine shroud rings has cut production time substantially and produces joints of consistently high quality, well above the minimum strength specifications. Brazing time has been reduced 50 per cent, the defect rate is well under one per cent and joint strength is several times higher than the required minimum.

In this operation, the inner ends of 28 nickel-steel blades are silver brazed to semi-circular brass shroud rings which form the stator stages of the Curtiss-Wright J65 single spool turbojet engine. This was the engine in the three F-84F's that won the 1954 Bendix trophy race and which hold the cross country speed record of 3 hrs, 46 min. It is also used in six other models of military aircraft, including the Grumman F-11F1 and the Lockheed XF-104, both capable of supersonic speed in level flight.

Initially, before the automatic induction

Fig. 2—Placing the clips of Easy-Flo brazing alloy over the ends of the blades before the brass shrouds are fitted in place. Circular fixture comes apart and each semi-circular section is handled and brazed separately

heating units were received, these assemblies were brazed with hand torches. A comparison between the two heating methods points up some significant differences in production savings and joint quality when large numbers of joints must be brazed simultaneously.

As the completed assembly in Fig. 1 indicates, the semi-circular assembly is composed of three components: an outer, aluminum carrier ring; an inner, brass shroud ring; and 28 nickel-steel blades. The outer end of each

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Fig. 3—Induction brazing machine where the 28 blade joints are made in a 10-min brazing cycle. The circular fixture rotates slowly on the rollers at bottom, moving the blades between the two parts of the stationary heating coil

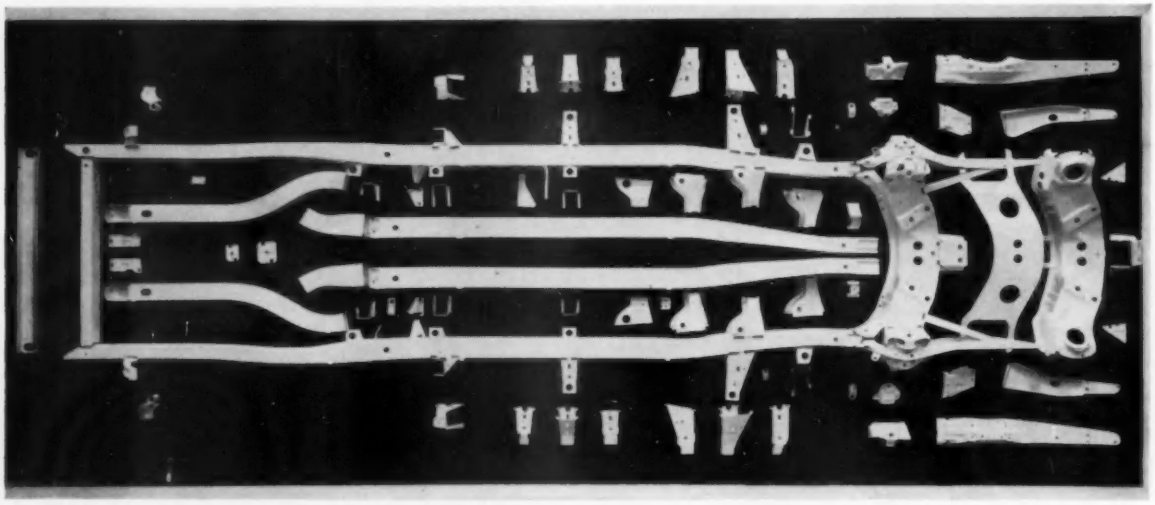


Fig. 1—This board provides a visualization of the Chevrolet tubular frame; as well as the great variety of component sections stampings and brackets required for its integration. In the center are the two main side rails; to the left are the center and rear end sections, respectively, that are butt-welded to form the complete side rail

Unique Production Methods for Chevrolet Chassis Frames

Completely Different Manufacturing Techniques for Making Side Rails, and Conveyor Line Arc-Welding, Among High Spots at New Chevrolet Stamping and Frame Plant

By Joseph Geschelin

REVOLUTIONARY methods for producing the unique box-section Chevrolet chassis frame from tubing are found in profusion in the new Chevrolet stamping and frame plant on the outskirts of Flint.

The plant combines two distinct operations — the frame section embracing some 366,000 sq ft, and the stamping section of 275,000 sq ft. These sections are isolated by means of a continuous fire wall, the entire plant being treated to complete fire protection, including a 100 per cent sprinkler installation. Altogether the operation boasts 1338 pieces of equipment, including 393 presses of various sizes and makes—Danly, Clearing, Bliss, Hamilton, Cleveland, and others—and 350 welding machines.

Vast as it is, the Flint operation produces only part of Chevrolet's frame needs. The remainder is purchased from outside suppliers.

In essence, the Chevrolet frame not only is new in design concept but entails an entire chain of hitherto unexplored manufacturing methods for producing the side rails, unique methods of bending side rails, conveyor line arc-welding procedures, automatic devices for handling parts and frames to reduce manual effort. The frame section alone has a total of some 10,000 ft of monorail conveyor systems, including one conveyor nearly a half-mile in length that transports finished frames from the ground floor, through the washer, up to the paint booth and drying oven on the roof, and back to the ground floor.

Highlights of this plant will be treated in two

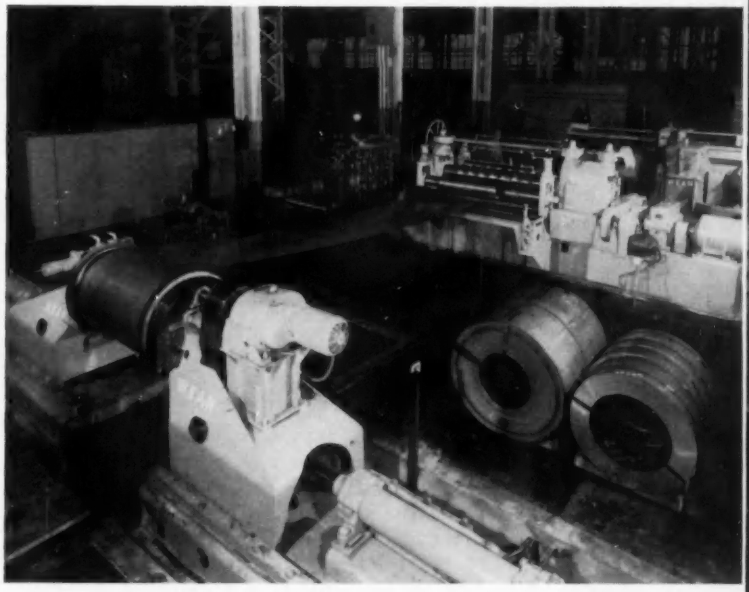


Fig. 2—Frame operations begin in the raw material bay where the huge coils of steel strip are slitted to the required width in the Wean installation seen here. Coils are mounted in the unit in the foreground, slitted and edged in the unit in the center, and recoiled and bound in the third unit in the background at the right

Fig. 3—McKay tube mill for producing the large section tubing for the main side rail. A similar unit is employed for making the smaller section tubing for the rear section of the side rail. The strip is fed as shown here, producing a circular section which is seam-welded in the resistance welding unit at the center (seen towering above the bed). As the tubing leaves the cooling tunnel beyond the welding station, it enters sizing rolls and, finally, the Turk's head. Tubing is produced at the rate of 150 fpm.

installments, this one concerned with frame manufacture; the second with fender and hood production in the press shop.

The Chevrolet frame requires an enormous amount of manufacturing detail and extends into many different areas of processing. It is composed of a large number of individual parts as may be noted in the exploded view, Fig. 1, all of which ultimately are integrated into the composite frame structure.

Frame manufacture begins in the raw material bay where huge coils of sheet steel are trimmed and cut into strips of proper width in the Wean equipment, shown here. It may be noted at this point that in addition to slitting it is necessary to trim the outer edges of the wide strip to get a true and square edge. If this were not done, the tubing could not be brought together properly for welding. As illustrated, Fig. 2, the big coil is mounted on the first unit—the Wean feed roll;

Fig. 4—Highlighted in this view within the frame fabrication area is the Bliss press for producing a perfectly square edge on the end of the side rail in preparation for reforming. In the foreground and to the left may be seen some of the automatic transfer mechanism for carrying side rails to the press and from the press to the next operation.

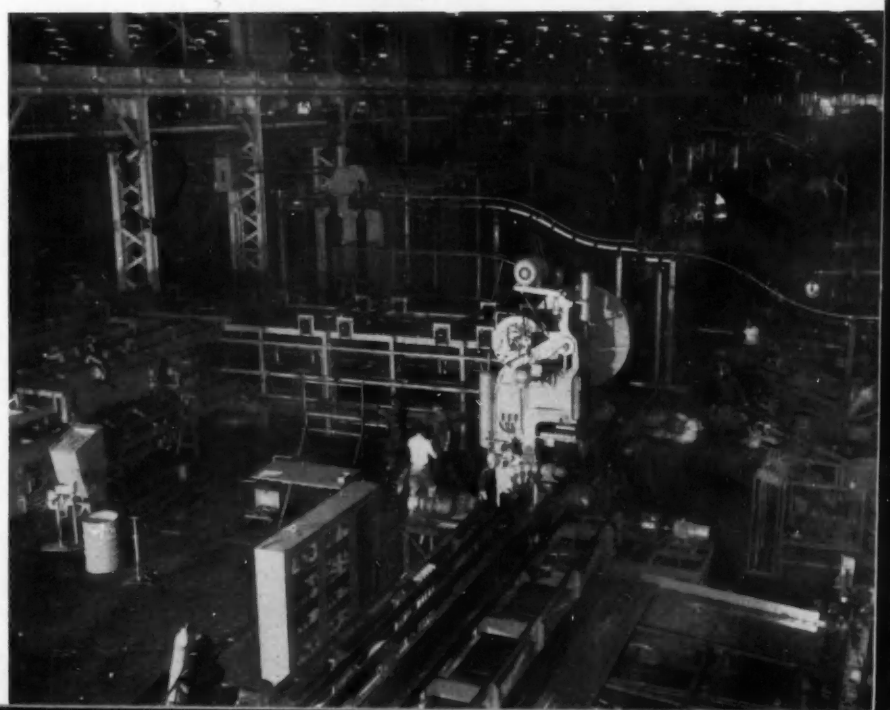


Fig. 5—Exterior of one of the special Danly reforming mills for the frame side rails. On the side of the machine, to the right of the operator, is the magazine for automatic feeding of rails to the work station. A similar magazine is located on the opposite side.

Fig. 6—Frame side rails are ungainly and rather awkward to handle. Here is one type of conveyor system employed in the frame plant. It transports side rails to the projection welders for tack-welding brackets. The monorail conveyor at the right may be seen transporting individual side rail sections on their way to the Taylor-Winfield butt welders.

Fig. 7—Side rails, consisting of three sections—the main side rail, the center section (light colored piece in the welding fixture), and rear section — are butt-welded in two operations in Taylor-Winfield welders. The first welder in the line welds the center section to the front section. The second operation welder, seen here, then welds the center section to the rear section.

then the strip is run through the Wean slitter; and finally recoiled and banded on the third Wean unit. The coiled strip then is ready for delivery to the two tube mills—one for large section side rails, the other for the smaller section tubing.

First major item of equipment is the big McKay tubing mill, Fig. 3, for producing the tubing for side rails. Latest of its kind and specially designed for this application, the tube mill starts first with the preparation of round cross-section tubing. At about the center of the machine, the tubing enters a butt welding station where the two edges are brought together under pressure and the welded joint completed by means of a pair of welding rolls. The welding head has a rated capacity of 200-kva with secondary current density of 58,000 amp. The tube mill operates at a speed of 125 to 150 fpm.

As the tubing leaves the welding station the outside flash is continuously removed by means of a heavy cutting tool, and is coiled on a spool for removal. Past this point the tubing moves through a large diameter tube where it is cooled by a flood of a coolant. It then enters a group of sizing rolls which gradually begin to break down the cylindrical form into a

roughly rectangular form; and finally through a Turks-head attachment which forms the tubing into a true rectangular form—4 by 4½ in.—ready for use.

Leaving the tube mill the tubing, traveling at some 150 fpm, is cut accurately into 204-in. lengths. This is done by means of a special McKay flying saw. The mechanism grips the tubing, travels with it, and during the brief time interval separates the tube and returns to cutting position. The tube is then halved into 102-in. lengths by a cut-off press.

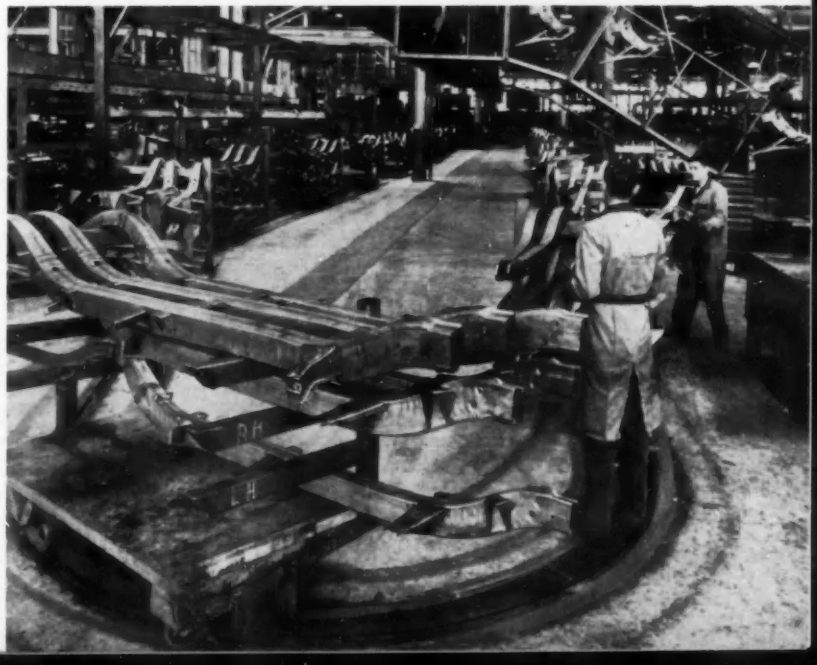
There is another complication, however. The forward portion of the side rail is required to have a deeper and narrower section to provide the necessary beam strength in the vicinity of the engine mounting. This requires a "reform" operation to reduce the original section by a form of coining, the operation being done by means of specially designed expanding arbor, lined with a special laminated material to reduce frictional loading. However, the use of the special mandrel made it necessary to provide a perfectly square and clean leading edge at the end of the tube. This requires a special press operation in the Bliss press, seen here, Fig. 4. Consequently, the cut tubing lengths first are transported by a series of automatic transfer mechanisms to the Bliss press; then returned on another conveyor system to the reform operation.

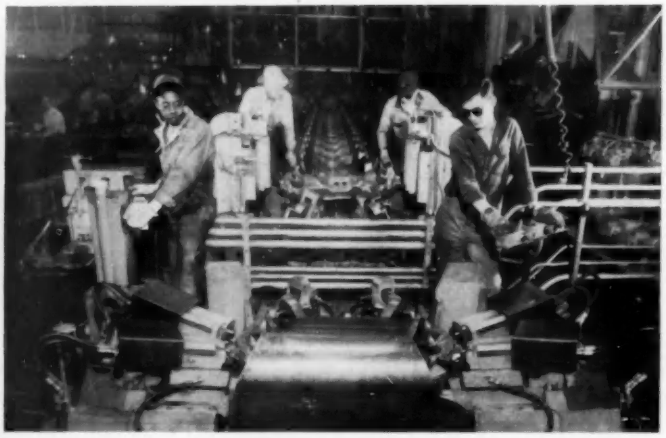
Here Chevrolet engineers worked with Danly to produce the special Danly reform mills, illustrated, Fig. 5. They are hydraulically operated, with shuttle type cross feed, central work station, and automatic loading as well as automatic stripping of the tube from the arbors at both ends. A unique feature of the equipment is the provision of automatic magazine feed, the magazines being housed along the two sides of the machine. There is no lost motion in its operation since a tube is readied for the operation from one side while another tube is being reformed. Productivity is around 165 pieces an hour on automatic cycle.

The next phase of the process is a matter of producing a series of five rather severe bends in the front

Fig. 8—Close-up of one of the automatic drilling machines for drilling all holes in the side rail. Not only is it extremely compact for the service it performs; it also serves to hold the side rail in exact position to assure perfect alignment of all holes.

Fig. 9—Long perspective of the merry-go-round line connecting preparatory operations—at the left—with the final frame welding line to the right. Batteries of projection welders for tack-welding all brackets to the side rails are located along the aisle at the left. Side rails for both right- and left-hand sides are placed on the carriages by the welder operators. As the carriages traverse the end of the line on the right hand side in this view, they are picked off in pairs and laid on the assembly conveyor.





◀ *Fig. 10 (at left)—One of the special Danly hydraulic piercing machines for piercing holes in all mounting brackets.*

▲ *Fig. 11 (above)—Final assembly operations on front cross-members. This line is fitted with a compact station for piercing a large number of holes; another station for riveting most of the fastening points. Piercing and riveting equipment was installed by Danly.*

▶ *Fig. 12 (opposite page)—Perspective of a portion of one of the frame assembly welding lines. One of the numerous power-operated, automatically actuated fixtures for turning the frame on its side to facilitate welding may be seen in the foreground. Farther along the line is an operator working on a frame now held in side position. Later on, another fixture lowers the frame onto the conveyor.*

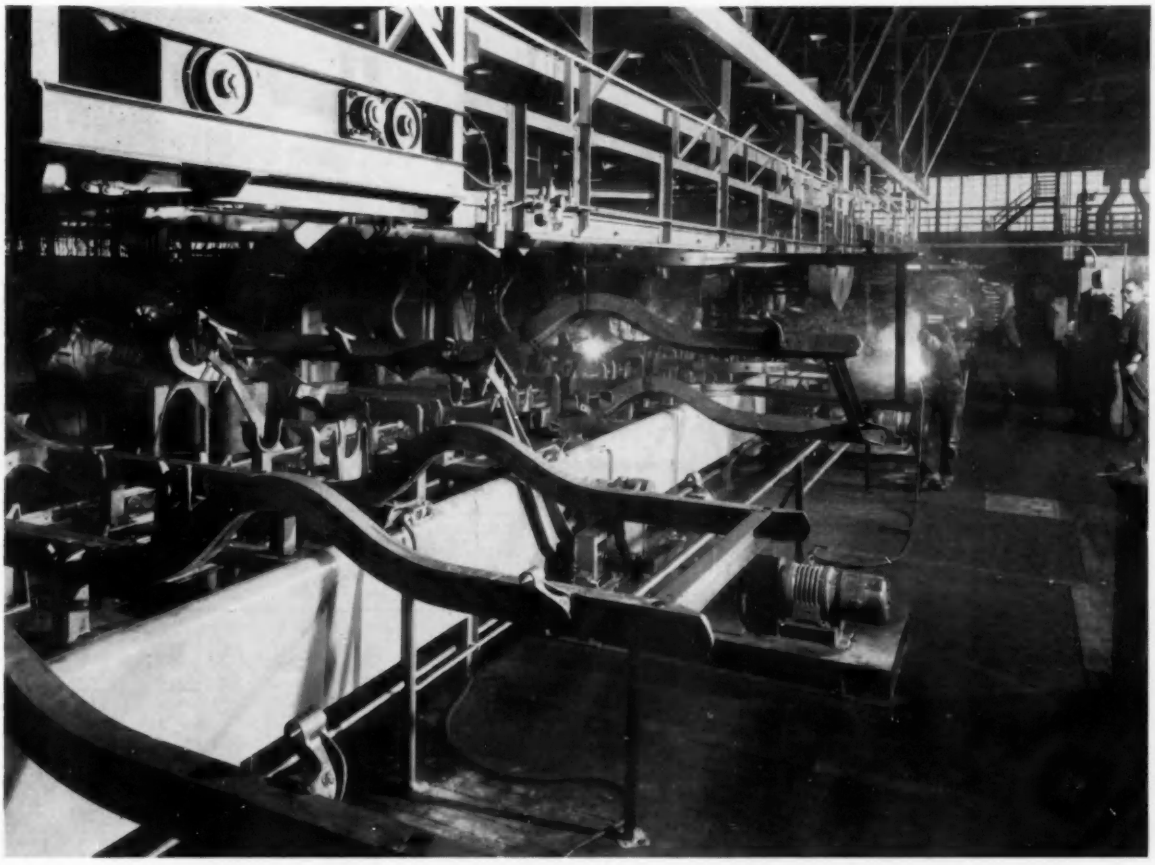
section of the side rail. What makes the situation even more difficult is the fact that the bends are all overlapping, in effect a bend on a bend, thus posing a serious problem of accomplishing the job without wrinkling the metal. This again was a cooperative project, this time with Pines, the producers of bending machines. In production, the bends are made one at a time in a series of five Pines benders, using a variety of special mandrels. The mandrels are of articulated design with a secondary articulated mandrel section that serves as a wedge or expander as the mandrel enters the tube. One of the most intricate of these is composed of some 70 details.

Frame plant production lines are so laid out as to handle right hand side rails on one outer side of the department, left hand rails on the opposite side. The two side rails ultimately come together near the end of the department when they reach the final assembly line.

The completed side rail is actually composed of three sections—the front section, described above, a center rail section to join the front and rear sections, and the rear section. The center section is a stamping assembly composed of two channel-shaped pieces, seam-welded together into a box section, using submerged arc welding. Before the junction can be made, the ends of the tubes of each of the three sections are sized in small horning presses. Finally, before welding, the end of each detail is fitted with a spacer or baffle to prevent buckling of the sides of the tube during the butt-welding operation.

Following the horning operations, the frame sections are suspended in sets on a long monorail feeder and storage conveyor to transport them around the battery of Taylor-Winfield electric butt welding machines. Welding is done in two stages: the first welder butt welds the center section to the front section of the rail; then the second welder butt welds the rear section to the center section, as noted in Fig. 7.

The next major step is the drilling of 14 holes in the left hand rail, 18 in the right hand rail for the attachment of clips, small brackets and other details. Drilling (Fig. 8) is done in special automatic drilling machines in a single cycle to assure precise positioning. The rails then move along a conveyor (Fig. 6) to a cross transfer mechanism which transports them to a magazine directly over automatic projection welding machines. Here the various brackets are tack-welded in accurate position and made ready for frame assembly. It may be noted that each side rail has two of these welders to handle the output, the rails being scheduled to each of the welding machines by an oper-



ator stationed at the controls of the transfer conveyor.

This marks the end of the preparatory operations. As the tack-welding is completed, the machine operator moves the rail off the unloading station and mounts it on one of the wheeled carriers that travels on a merry-go-round rail in the floor, Fig. 9. This makes it a simple matter to collect both right and left hand side rail assemblies from the welders on each side of the department, permitting them to move past the start of the final assembly lines where they are picked off in pairs.

It may be noted that the numerous other details are prepared in other areas of the plant in readiness for delivery to the frame assembly line. Most important of these is the front cross member assembly which is installed as a unit. One of the noteworthy operations on this assembly is the piercing of a large number of holes in the sides and ends. The Danly hydraulic piercing machine, illustrated (Fig. 10), provides an interesting example of planning to simplify the operation, and thus achieve a greater degree of compactness than would be possible with a conventional multiple drilling machine.

Following piercing of holes, the front cross member assembly is transferred to a Danly hydraulic riveting machine, Fig. 11, that makes up all riveted fastenings, except several spots that are inaccessible to it. The latter are riveted by means of Hannifin hydraulic riveters.

At the assembly lines, the side rails, cross members, and the sheet metal front cross member structure are assembled together in fixed position fixtures to assure perfect alignment, then tack-welded securely. This operation is intermittent. All of the welding on the assembly lines is done on the moving conveyor, with normal downhand procedures, using power from a large battery of welding generator cabinets supplied by well-known producers, including Westinghouse, General Electric, and P & H. They are all rated 400-amp capacity.

It is noteworthy that the intricately-operated assembly conveyors were developed to Chevrolet requirements and installed by Planet Corp. To facilitate downhand welding at all points, the conveyor systems operate with a continuous cycle, and are provided with automatically-operated turnover mechanisms at a number of points to raise one side of the frame at one point, lower it, raise the opposite side, etc. Thus the operators at each station have the frame presented at a convenient position (Fig. 12). All brackets, including the steel spring hangers, are securely welded

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Pilot Injection Versus Cetane Numbers

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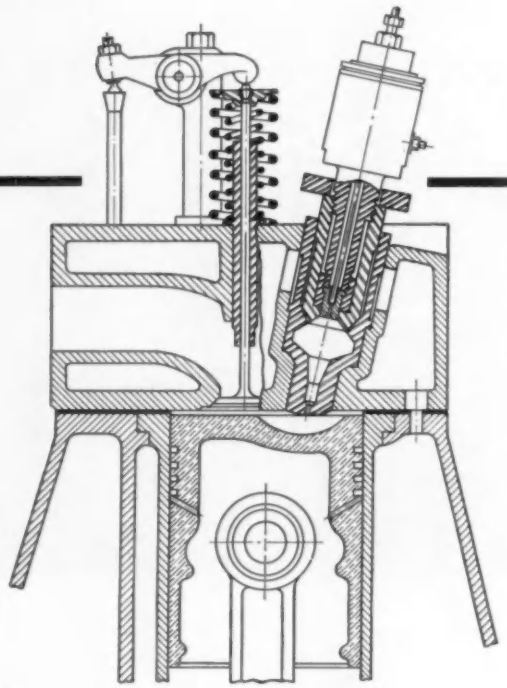


FIG. 1—Cross-section of engine showing precombustion chamber and adaptor to accommodate the magnetically actuated fuel injection valve.

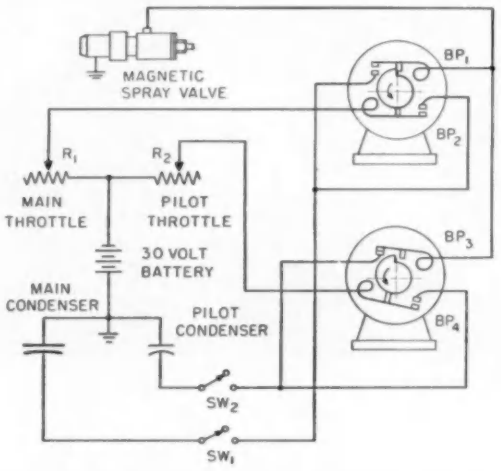


FIG. 2—Wiring diagram for the main and pilot circuits to actuate the magnetic spray valve.

PILOT injection as been recognized as a means of eliminating combustion knock in Diesel engines by the control of ignition delay.[1,2,3] A satisfactory system might reduce fuel sensitivity, increase power and fuel conomy, and reduce the stress on engine parts. These add up to reduced operating costs, and are of interest, providing the initial cost of the installation is not prohibitive.

In order to study the influence of pilot injection on the fuel sensitivity of a 4.5 by 5.5 in. precombustion chamber type single cylinder Diesel engine, Fig. 1, the conventional jerk-pump fuel system was replaced by a common-rail system. The system consisted of a fuel tank mounted on a torsion balance from which the fuel was transferred to a single cylinder high pressure fuel pump which delivered it to a surge chamber or reservoir. Fuel lines led from the surge chamber to a magnetically actuated fuel injection valve, to a pressure gauge, and to a fuel regulating valve. Fuel by-passing the regulating valve was returned to the fuel tank on the torsion balance. The fuel pressure at the injection valve could be controlled by the regulating valve at any desired pressure between atmospheric and the pump delivery pressure of 3500 psi. The weight of fuel injected per cycle was determined from the change in weight of fuel indicated by the torsion balance and the revolutions recorded in the same time interval by an electric timer, an auxiliary of the Sprague electric dynamometer.

The weight of fuel injected per cycle was controlled, at constant injection pressure, by the elapsed time during which the injection valve was open. This time interval is controlled by the discharge from a condenser through the injector solenoid.[4] A current of

approximately five amperes is required through the solenoid coils to lift the needle off its seat, and approximately three amperes to hold the valve open.

The magnitude of the charge on the condenser, and the operation of the injector, was controlled by the circuit shown in Fig. 2. Dual circuits are shown, one to control the pilot injection, the other the main injection. The two systems are manually controlled by the spst switches SW_1 and SW_2 and may therefore be operated separately or together. With switch SW_1 closed and SW_2 open, the main circuit is in operation. When the cam operated breaker points BP_2 are closed, the main condensers are being charged to a value controlled by the rheostat setting R_1 and the length of time the contacts are closed. When the cam is rotated the breaker points BP_2 are opened and points BP_1 are closed to connect the charged condensers across the magnetic spray valve and complete the main injection cycle. With switch SW_2 closed, the pilot circuit operates in a similar manner either separately or in conjunction with the main circuit.

The timing device consists of two duplicate units, one for the main charge and one for the pilot. The timer was mounted on the engine in place of the jerk pump and driven through the pump coupling. Each unit of the timer consists of a four inch diameter aluminum plate upon which two automobile type breaker points are mounted 180 deg apart. The upper breaker points on each plate time the spray valve opening, while the lower breaker points time the charging of the condensers. The plates are independently adjustable, through 360 deg, for separate timing of the main and pilot charges. The rim of each plate is graduated at two-degree intervals to 720 deg to facilitate timing the opening of the spray valve. A cam rotating at half crankshaft speed, to operate the breaker points, runs centrally through both plates. The condensers used throughout the tests were of the dry electrolytic type rated at 850 mfd—50 v for the main injection and 500 mfd—50 v for the pilot injection.

The advantages of the described system are the availability of an injector with a rapid response permitting the delivery of a pilot charge and at any desired time thereafter a main charge, and a common-rail system in which the fuel charge is not limited by the dynamics of a fuel column or the engine speed. The magnetic injector has a further advantage that in construction no parts need be held to the close tolerances normally associated with Diesel injection systems.

The tests were conducted to investigate the possibility of operating a single cylinder precombustion chamber type Diesel engine, using pilot injection, on low cetane fuel with the same knock-free performance

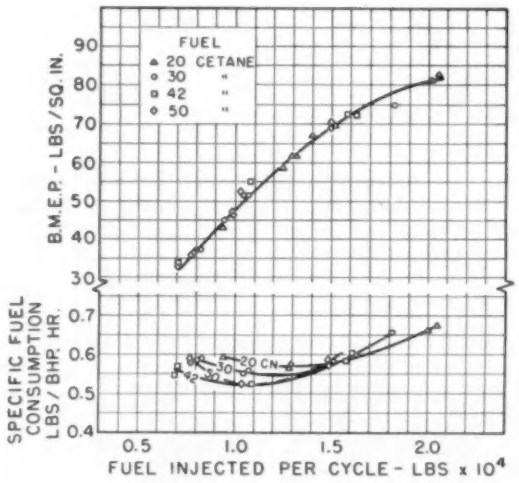


FIG. 3—Power and economy as a function of throttle position when operating with pilot injection. Engine speed 1200 rpm, pilot charge 35 deg btdc, main charge 5 deg btdc.

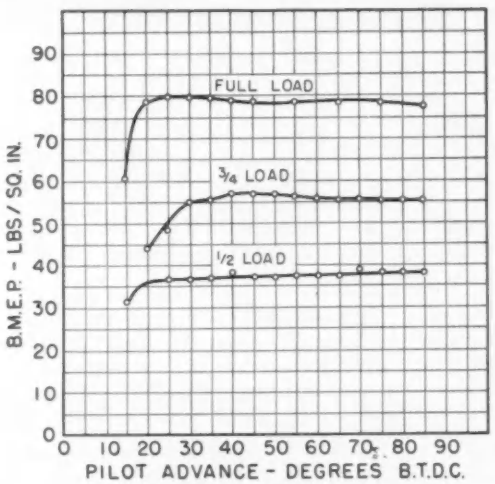


FIG. 4—The effect of pilot advance on power when operating at 1200 rpm with 42 cetane fuel.

[1] "Pilot Injection," D. Jafar, *Engineering*, Vol. CXLIV, October 15, 1937, pp. 417-419.

[2] "What Can Be Gained by Pilot Injection?", P. H. Schweitzer, AUTOMOTIVE INDUSTRIES, Vol. 79, No. 18, October 29, 1938, pp. 533-534.

[3] "Pilot Injection," A description of equipment manufactured by CAV Ltd., *The Automobile Engineer*, Vol. 40, June, 1940, p. 227.

[4] "Characteristics of a Magnetically Actuated Fuel Injection Valve," C. J. Vogt and T. A. Rogers. AUTOMOTIVE INDUSTRIES, Vol. 80, No. 16, April 22, 1939, pp. 530-536.

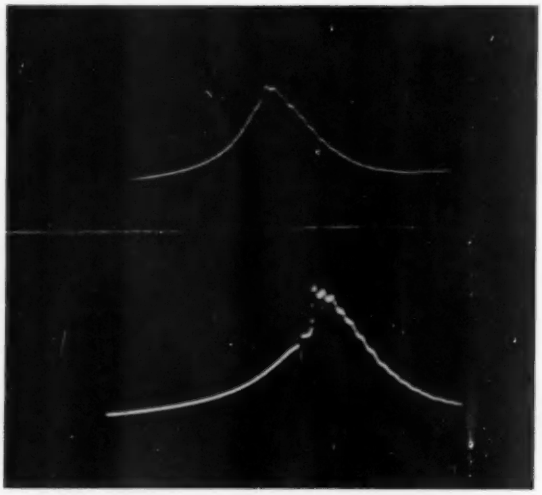


FIG. 5 — Typical cylinder pressure-time diagrams when operating with pilot injection (upper diagram) and when operating without pilot (lower diagram).

and smoke limitation as is possible when operating with 50 cetane fuel. Also to determine the optimum timing of the pilot charge relative to the main charge to obtain best performance. The summary of the results are presented in Figs. 3 and 4.

The fuels used were blends of alpha-beta-methyl-naphthalene, 42 cetane automotive Diesel fuel, and T-12 ASTM-CFR reference fuel (71.5 cetane number). All fuels used were checked for ignition quality according to ASTM method D613-41T.

The results plotted in Fig. 3 were obtained when using fuels having a cetane rating of 20, 30, 42, and 50, operating the engine at a constant speed of 1200 rpm and changing the load by increasing the weight of fuel injected. The pilot charge was injected at 35 deg btdc, a value determined by preliminary tests and recorded by some representative values plotted in Fig. 4. The main injection followed the pilot injection by 30 deg crank angle, or was set to occur at 5 deg btdc.

The size of the injector used in the described system is fixed by the size of the engine specifications. This immediately sets the lower limit on the weight of fuel injected for the pilot charge. For the given electric circuit characteristics and fuel oil pressure of 3500 psi, the minimum fuel on the pilot charge is about adequate to operate the engine at no load. This setting for the values given in Fig. 3 is equivalent to the pilot charge supplying 50 per cent of the total fuel injected at half-load and 21 per cent at full-load condition when operating on 42 cetane fuel. When operating with lower cetane fuels the best performance was obtained with an increase in the weight of fuel in the pilot charge as the cetane number of the fuel was decreased. When operating at full-load conditions with 20 cetane fuel 30 per cent of the total weight of fuel injected was in the pilot charge, so that approximately 10 per cent more fuel is added to the pilot charge to maintain the same knock-free operation when the cetane number of the fuel is reduced from 42 to 20. The need for increasing the amount of fuel in the pilot charge as the cetane rating of the fuel is decreased is due to the higher temperatures required to compensate for the increase in the self-ignition temperature of the low cetane fuel. The higher end temperature required of the pilot charge also results in an increase in the heat transferred to the cooling media. The latter effect is particularly noticeable at light loads as indicated by the higher values of specific fuel consumption of the low cetane fuels. Fig. 3. This effect was further evident at low speeds when operating with 50 cetane fuel where for equal weight of fuel injected the bmep was less when using pilot injection. At 1200 rpm the heat loss to the surroundings due to the early injection of the pilot charge was no longer detectable.

Figure 3 indicates that the power output of the engine is not influenced by the cetane rating of the fuel when using pilot injection and that the specific fuel consumption of low cetane fuel is better at three-fourths to full-load operation than when operating with high cetane fuels.

Characteristic cylinder pressure-time diagrams are shown in Fig. 5. The upper curve shows knock-free performance with 30 cetane fuel at 1200 rpm and 3500 psi injection pressure. The pilot charge was injected at 35 deg btdc followed by the main injection at 5 deg btdc. When the pilot charge was cut out, the main charge injecting at 5 deg btdc, severe knocking resulted as indicated by the lower diagram.

Summary

The magnetically actuated fuel injection valve operating on a common-rail fuel system is not influenced by the surge in the fuel column as experienced in a jerk-pump system. It is therefore possible to accurately repeat successive sprays at extremely close time intervals, or separately control each spray independently one from the other. This flexibility permits control in such manner that a small initial fuel charge may be injected into an engine cylinder ahead of the main charge to act as a pilot and eliminate to a large extent engine fuel sensitivity. The investigation has shown that a precombustion chamber type engine may be operated with pilot injection on 20 cetane fuel as successfully as when using 50 cetane fuel.

The use of the magnetically actuated fuel injection valve eliminates the necessity of dual fuel systems, and may be substituted for the conventional jerk-pump fuel system without altering engines to which adapted.

Automatic Production *of Rear Axle Housing Flange*

THE 1200-ton Verson All-Steel transfer press shown here is one of the noteworthy items of the new equipment for producing 1956 Buick rear axles at Flint. At the present time the press is set up for producing the rear axle housing flange—Fig. 1—starting with the disk-shaped blank shown at the lower left. The press, fitted with five working stations, has a completely automatic cycle, the blanks being fed automatically to the first station from the indexing table which may be seen at the extreme right in Fig. 2. The entire feeding mechanism, including automatic pick-up of blanks by a vacuum-operated feeder, is part of the Verson equipment.

As the finished flange—upper right hand in Fig. 1—is completed, it is automatically ejected onto a conveyor at the left in Fig. 2 for transport to the washer and then to the welding machines for joining to the rear axle housing.

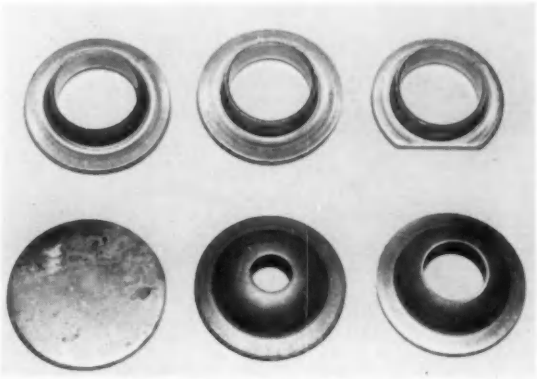


Fig. 1—Six steps in producing the rear axle flange

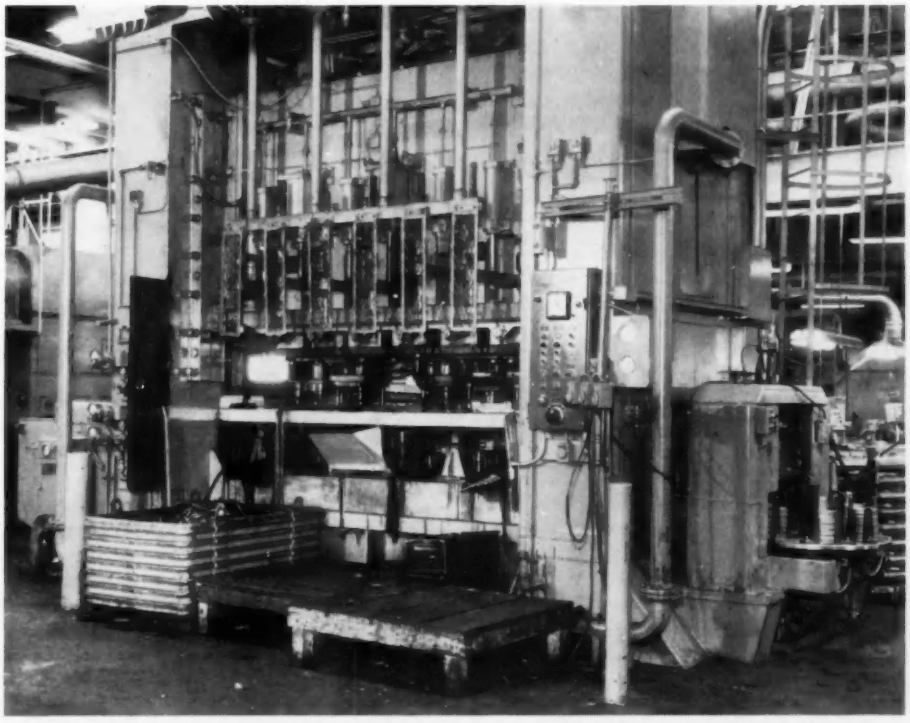
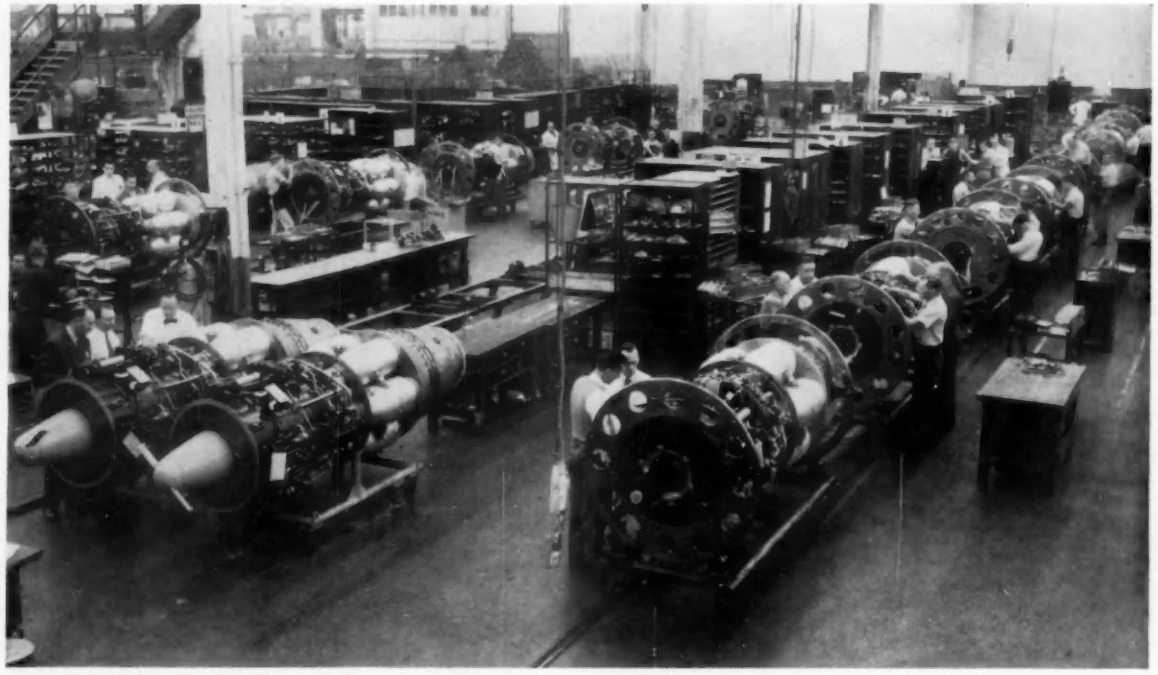


Fig. 2—The 1200-ton Verson All-Steel transfer press fitted with five working stations



Section of the final assembly line at Orenda Engines, Ltd.

Military Orders Sustain

CANADA'S aircraft and engine factories are producing mostly military aircraft to the annual value in recent years of about $400 million. Canadian-built aircraft are now being flown by military pilots not only of the Royal Canadian Air Force in Canada and in Europe, but also by pilots of the United States Air Force, the British Royal Air Force, South African Air Force, and the air forces of Norway, Greece and Turkey. Civilian airlines and commercial charter transport operators in more than two dozen countries are flying single-engined Canadian transport planes.

The Canadian aircraft industry is being maintained, mostly with military orders, at about the same production stage as it was at the peak of the Second World War. Canada is producing only a limited number of specialized fighter planes, trainers and single-engined civilian transports. At the same time Canadian aircraft factories are currently designing and preparing to produce within the next two years supersonic all-weather fighter aircraft and 120 passenger turboprop airliners to compete on the world's commercial airways.

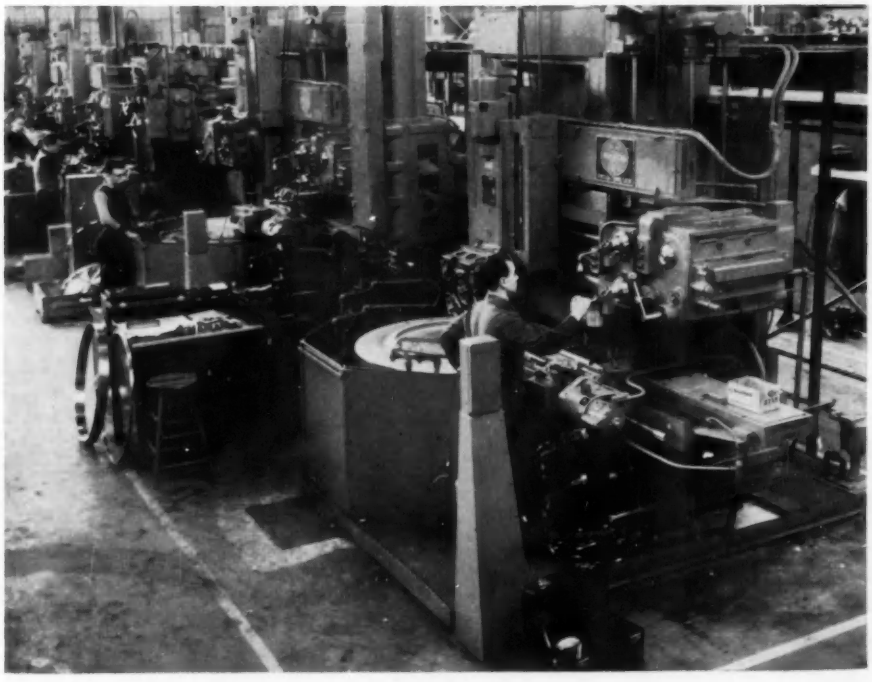
Of Canada's 16,000,000 people some 38,000 are employed in aircraft manufacturing factories. This total does not include some 12,000 people employed by components manufacturing plants. Aircraft manufacture has become one of Canada's leading industries.

Canada's American-born Defence Production Minister C. D. Howe has stated that "the defence program is by far the most important factor in Canadian aircraft production today. The volume of planes needed to meet the operational requirements of the armed forces, and the portion of the requirements that can be produced economically in Canada, are the factors which determine the level of the aircraft construction in the country. As far as possible, orders are placed with Canadian manufacturers, for an experienced and efficient aircraft industry is a vital part of Canadian defence potential."

The aircraft industry in Canada today is a greatly expanded version of the Second World War establishment. New factories have been built and old plants have been enlarged. Production has been largely based on a minimum number of fighter planes and various types of trainers. While previously Canada had imported all its aircraft engines, several engines are built in Canada now, requiring the establishment of a complex components manufacturing industry. This has been recruited from both United States and Great Britain, and Canada's entire aircraft industry today, from components to the actual airframe and engine factories, consists primarily of subsidiaries of United States and British companies.

The aircraft industry is centered largely on the outskirts of Toronto and Montreal, Canada's two larg-

By James Montagnes



View in the Machining division of Orenda Engines, Ltd., where jet engines for fighter aircraft are produced

Canadian Aircraft Industry

est cities. There are some large component and overhaul plants located at other major cities throughout Canada, and one factory making trainers for both the United States and Canada at Fort William, on the western shore of Lake Superior.

Outside Toronto are three subsidiary factories of British aviation. Largest of these is Avro Aircraft Limited, manufacturing the CF-100 all-weather twin jet fighter. This aircraft was designed and produced entirely in Canada, and is now in its fourth version. The CF-100 Mark 4 is armed with 50 caliber guns and rockets. Being an all-weather fighter it has complex radar equipment and weighs about 18½ tons. It is powered by two Avro Orenda engines, made by the affiliated and adjacent Orenda Engines Limited plant. The CF-100 is currently in use by the Royal Canadian Air Force squadrons in Europe as well as in Canada.

Avro Aircraft has been tooling up for production of the CF-105, a supersonic all-weather fighter to be powered with a new Orenda engine to do 1200 mph and have a range of 1500 miles. The CF-105 is being designed at the Toronto plant. To aid in its production a 15,000-ton hydraulic rubber pad forming press was imported from West Germany. First of a small number of prototypes is expected to be ready by early this year and production is to be well underway within a few years. Until the new Orenda PS13 engine is ready, the CF-105 is to be powered with Pratt & Whitney J57 jet engines.

At Orenda Engines jet engines are built. The company, along with Avro Aircraft, is owned by A. V. Roe Canada Limited, which is a subsidiary of the Hawker-Siddeley group of aircraft companies of England. Orenda began production soon after the Second World War with the first airplane engine ever made in Canada. The first model was produced in 1950 and used in a North American Sabre F86A. In 1952 production of the engines was well under way and by mid-summer 1955 about 2500 Orenda engines had already been delivered to the Canadian government.

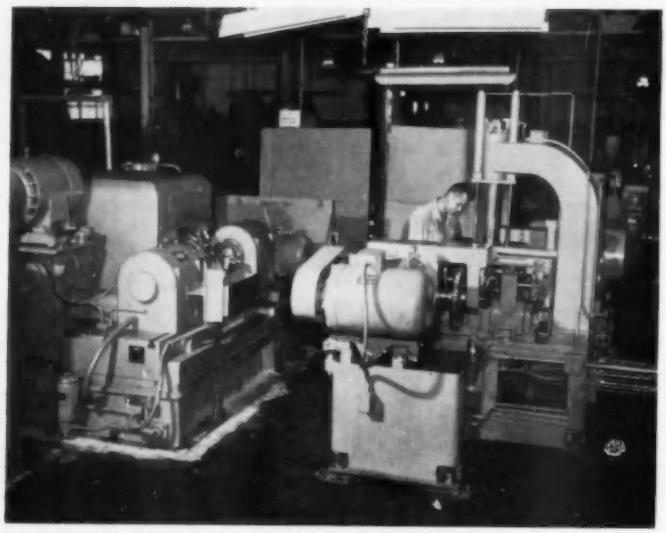
The Orenda engine is now in its 14th model, and is being used in F-86-F Sabre aircraft produced in Canada at Montreal, and flying with the Royal Canadian Air Force in Europe, where the Sabre-Orenda is considered the fastest fighter in use with NATO forces.

A new twin-spool axial flow jet engine is being prepared for the CF-105. It is expected to have a thrust of between 15,000 to 20,000 lb, more than double the thrust of the Orenda 11 which is used in the CF-100 Mark 4 fighters. This new engine will use large amounts of titanium alloys from another affiliated company, Canadian Steel Improvements Limited, Toronto.

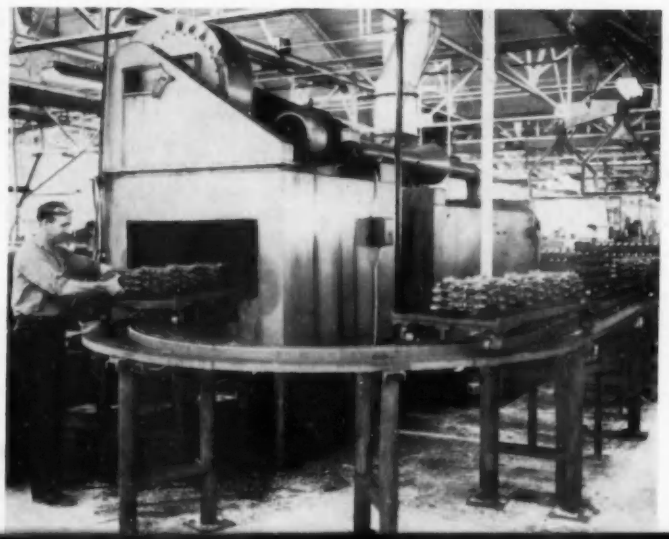
(*Turn to page* 112, *please*)

19,000 Engines

Wisconsin-built setup for drilling, countersinking, surfacing, and tapping manifolds at rate of 157 pieces per hour.



Turning and milling four-throw crankshafts for V-type engines. The crankshaft lathe is a Wickes; the milling machine was made by Motch and Merryweather.



Parts such as crankshafts, connecting rods and camshafts are washed in this combination washer and dryer. A high-pressure spray does the washing.

PRODUCING 19,000 heavy-duty air-cooled engines per month, Wisconsin Motor Corp. uses versatile machinery to integrate its seven basic engine models. Modernization of its newest plant, the former Sterling Motor building adjacent to the main plant in Milwaukee, is just about completed after a two-year program. A number of operations show the results of inventiveness and ingenuity to develop simple, work-saving automation at the lowest possible cost.

Operators usually handle two or more machines on a piecework basis. They are not responsible for maintenance of the machines. This frees them for maximum efficiency and puts preventive maintenance responsibility on a full-time crew. The system has decreased downtime and increased production.

The cylinder and crankcase are in the form of a one-piece iron casting for the single-cylinder and in-line models. Castings are first milled on top, bottom and sides. Then they are bored on a W. F. & John Barnes four-position machine at the rate of 200 pieces in eight hours. A three-spindle vertical head rough bores one cylinder, finish bores a second, and chamfers a third. At the same time, a two-spindle horizontal head bores the two crankshaft bearing holes and magneto bearing hole in the block.

Cylinder blocks for V engines are milled top and bottom, and the manifold face and valve spring chamber face are milled on a Fitchburg machine. Adaptable to three sizes of blocks, the machine uses four special fine-tooth cutters. At a table speed of 25 ipm, the production rate is up to 510 pieces in eight hours.

Valve guide holes for all multi-cylinder blocks are drilled on a machine of Wisconsin's own design on a Simplex base, together with a New Britain boring and reaming machine. The Wisconsin machine is hydraulically powered by a Dudco 3000 rpm, 30 gpm pump, con-

per Month from Versatile Production Lines

By Paul C. Kennedy

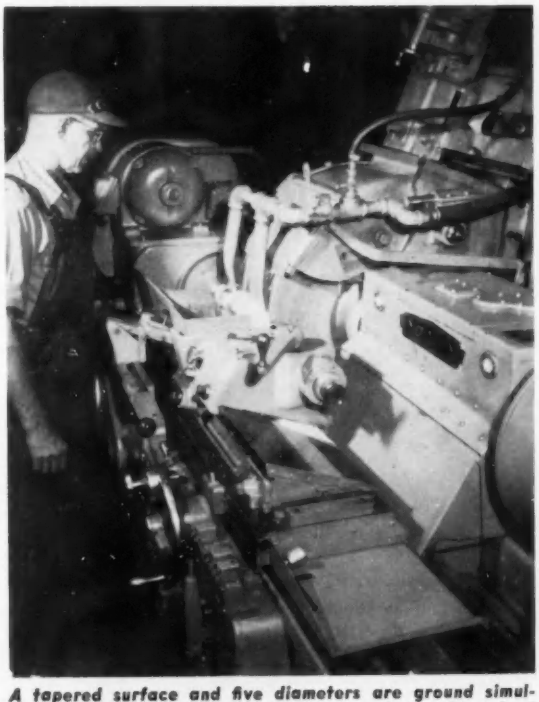
trolled by Racine valves. This allows boring at high speed, followed by instant shift to low speed for counterboring the valve seat insert location. Parallelism is held to 0.0005 in.

Aluminum cylinder heads are face milled at 2700 rpm, 50 ipm on a Sundstrand Rigidmil. Two air clamping fixtures allow one operator to turn out 1200 pieces in eight hours.

Cast iron manifolds are quick drilled on a machine assembled by Wisconsin. Three Delta vertical multiple-spindle drills and several horizontal drilling heads are set up around a four-station dial type table. They are provided with automatic cycling controls to drill, countersink, spotface and tap five holes, finishing 157 pieces per hour. Actuation is by Bellows air power.

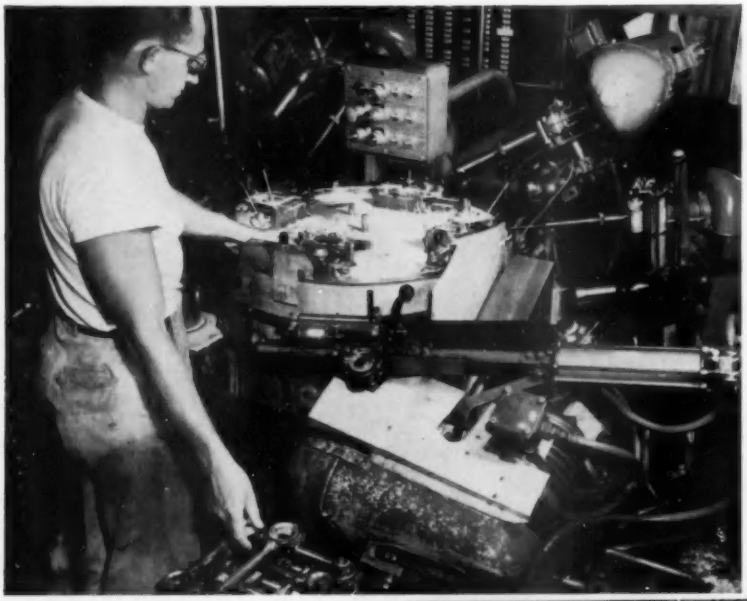
Forgings are stress-relieved in three Lindberg Cyclone gas furnaces. Charges of up to 3750 lb in buckets are heated to 1100 F for one hour per inch of cross section thickness, then air cooled.

Crankshafts for V-type engines are sandblasted, centered and ends turned, and counterweights turned. The driver hole is drilled and reamed. Two of the latest type milling and turning machines finish all



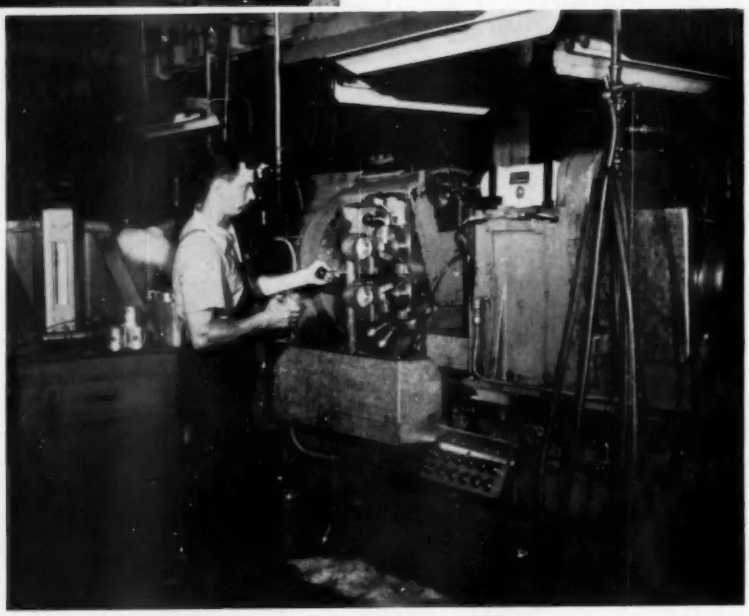
A tapered surface and five diameters are ground simultaneously on crankshafts in this Norton grinder. The wheel is re-formed after 40 parts are produced.

When the cap is split from the connecting rod, both parts are numbered for identification. At the same time the operator mills the bolt and nut faces.



Connecting rods are drilled and countersunk in this special machine to permit oil to reach the bearing surface. The machine was made in the Wisconsin plant.

This Simplex machine rough and finish bores piston pin holes; faces counterbores and chamfers the bottom, and grooves the piston pin holes for the retainer rings.



surfaces except the crank pins. The Motch and Merryweather milling machine uses two cutters to mill web and counterweight clearances. It features a hydraulic lifting and turning device to make eight cuts. Next, one of two new Wickes crankshaft lathes automatically turns and cheeks all four crank pins at once, by using a master crankshaft as a template. One operator for both machines produces 25 completed crankshafts per hour. The machines can be changed quickly to handle any of three different crankshafts. These and other machine tools are served by a central coolant system.

Following stress relieving and sandblasting, single - cylinder crankshaft counterweights are milled and both ends of the shaft are center drilled on one machine. Next they are turned all diameters on both ends, and the cheek is faced on the flywheel end, on Fay automatic lathes. Carbide tools feed 0.023 in. per revolution (958 rpm) to machine 62 pieces per hour. In another operation, the flywheel end is faced, drive end is cut off, and both ends are recentered. Then five diameters and a tapered surface are finish ground at one time on a Norton grinder. This machine features automatic hydraulic forming of the wheel after each 40 parts. Output is 54 crankshafts per hour. This machine reduced direct costs over two-thirds when it was installed recently.

Conventional operations follow to rough and finish grind the pins, thread the flywheel end, and mill three keyways. The flywheel end is threaded by a Cleveland lead screw tapper set vertically. Rapid traverse is controlled by the die opening.

Washing crankshafts and other forgings is done automatically through a Solventol combination washer and dryer. A conveyor with six dollies working in a closed loop allows the operator to stand in one position to load and unload. Crankshafts are handled on a rack; loaded on the dolly by a hoist. The system uses a high pressure spray and high velocity air dry. After washing, crankshafts are balanced, burrs are filed off, the pin bearing is lapped and the workpiece is again washed.

Camshafts are ground automatically on a Norton

cam grinder, which features automatic spindle motor control.

Connecting rods are drilled and reamed for the piston pin at the rate of 200 per hour. An eight-spindle Davis and Thompson Roto-Matic operates continuously to produce upwards of 20,000 rods per month, in seven types and sizes. Following milling flats, boring the crankpin end and drilling bolt holes, the rods are stamped on both ends with a pneumatic device which has tripled production over a previous hand operation. The stamping operator now can load the M&M machine or milling the bolt and nut faces and sawing the cap from the body. Output is over 150 per hour.

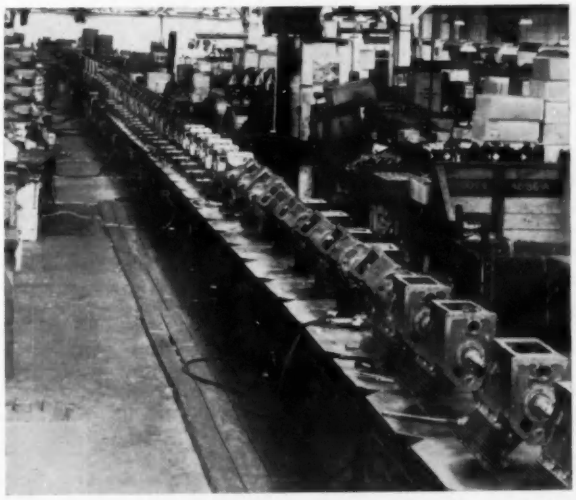
Rod and cap are broached on a Lapointe machine to assure a round hole for the babbitt, and for good adhesion. A home-built babbitting machine operates on a four-stage cycle, and is said to be easily converted to the precision-type shell in the future. The oil hole is drilled and counterbored, on a Wisconsin-made machine, at the rate of 1700 per hour. The four-station machine, using Delta drills, is operated by Bellows air motors.

Piston production starts with aluminum castings. Two at once are rough and finish bored, faced, counterbored and chamfered, and grooved for the piston pin retainer ring, all on a Simplex machine. The chucker is reloaded by hand with two new castings while working on two pieces. Cycle time is one minute. The operator uses a Precisionaire gage to help maintain bore diameter to 0.0003-in. accuracy.

Oil holes are drilled in the piston on a Wisconsin-assembled semi-automatic machine. Eight Delta drill heads surround a central work fixture. The operator places the piston on a pin, through the piston pin hole. The piston is located by the pin and by a block which rests on the top of the piston. The fixture lowers to drilling level, the drills advance and retract, and the fixture rises. Production rate is 400 per hour. The machine is easily adapted to a number of piston sizes.

Final assembly takes place on waist-high conveyor lines. Each engine rests on a small platform, which rides the roller conveyor. Output of V-type engines is 300 per day on two lines. Running-in of all engines takes place in a modern test room. Engines are carried on overhead hoists to any of 230 positions, for a four-hr run. Fresh air enters around the base of each engine and is exhausted by huge fans. Final painting is done in a Binks water wash spray booth.

Wisconsin-assembled semi-automatic machine for drilling oil holes in pistons. Production rate is 400 pistons per hour.



Assembly line for V-eight engines. Each engine rests on a table which in turn rests on rollers. This permits moving the gradually-growing engine manually from person to person.

Running-in and final testing of all engines are done in this modern facility. Each engine is run for four hours.

Brussels Automobile Show

Keen Competition for Belgian Market Seen with Passenger Car and Truck Exhibits from Many Countries

By W. F. Bradley
Special European Correspondent
for AUTOMOTIVE INDUSTRIES

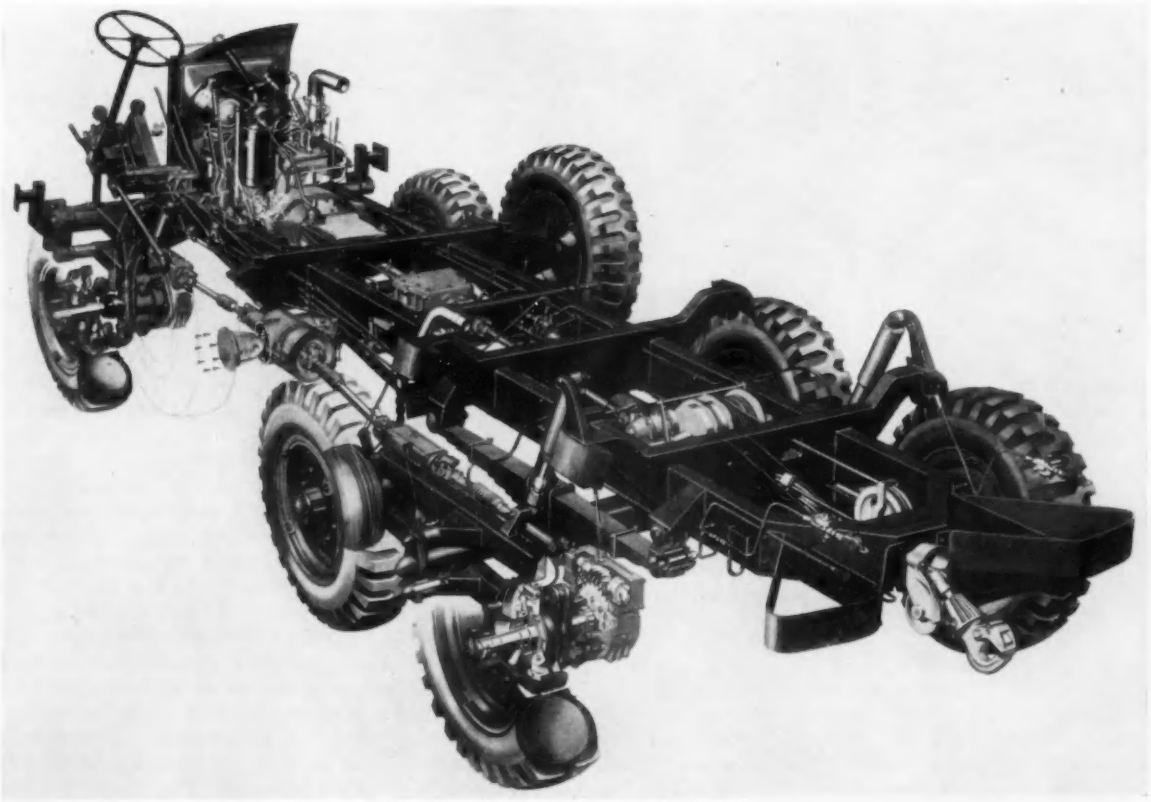
East German EMW 311, a five-passenger, four-door sedan (United Press photo)

BRUSSELS, BELGIUM—THE Brussels automobile show, with 82 makes of passenger cars and 94 truck producers, attracted exhibits from many countries as a result of the broad economic policy of the Belgian government.

For three years the policy has been to encourage assemblies in the Benelux territory by a minimum five per cent duty on parts and the maximum 24 per cent on complete automobiles. As a consequence of this, the total of 23,057 American passenger cars put on the Belgian market last year comprised only 514 imported complete, and of 5142 trucks all but 17 came in knocked-down form. On the total figure of 106,780 passenger cars put into service last year 94,809 were assemblies, and of 18,767 trucks there were 15,687 assemblies. Complete automobiles are not shut out, but importation is limited to 250 cars per make per year. All of these are expensive models for which the small demand would not justify an assembly line. Where 50 per cent of the value of an assembled automobile is of Belgian origin, it can be exported as a Belgian product. Last year, in addition to about 110,000 sales on the home market, from 29,000 to 30,000 cars were exported, mostly to soft currency countries.

Fiat 600 General-purpose car

A feature of the Belgian market is the keen competition from Germany; that country now heads the list of importers with 39 858 passengers cars last year and 6572 trucks. The two firms mainly responsible for this were Volkswagen and Opel. France has secured second place, with 25,848 passenger cars and 2949 trucks. While the United States is third with a total of 28,216 automobiles, the high proportion of trucks puts the value of American imports just ahead of those of France. England has lost ground, particularly in passenger cars; and while the reduction on trucks is less, the total puts the United Kingdom



Van Doorne 6 x 6 artillery tractor

in fourth place. Russia's share in the Belgian market was 54 completely assembled passenger cars (compared with 40 a year ago) and 48 trucks.

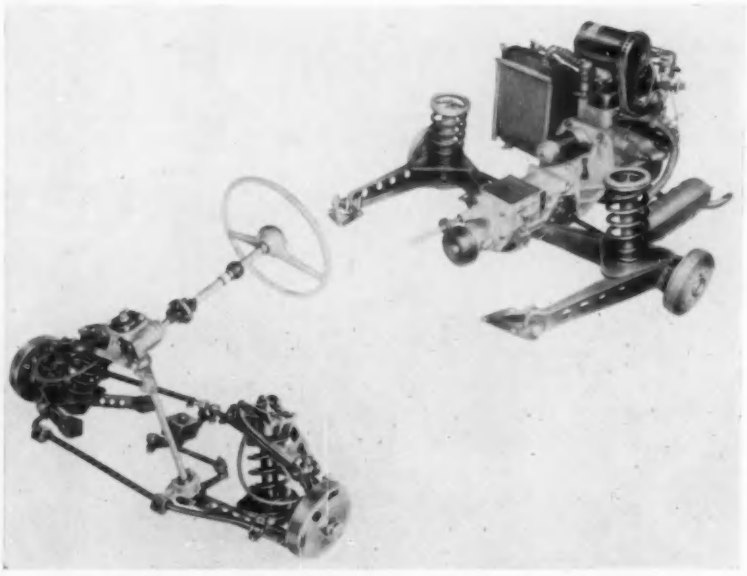
There is undoubtedly a movement in Belgium toward the smaller, economical European-type automobile, instead of the larger American cars. Thus, for the first time France went out ahead of the United States with 22,000 passenger cars in the first 10 months of last year, compared with 19,000 for the U. S. A. Ford and Chevrolet held the lead. While all British makes showed a drop, the English-built Ford Prefect marked a substantial increase.

All the 1956 American models were displayed at the show. The center of attraction on the Cadillac stand was the La Espada experimental car with plastic body. Ford differed from the others by having a special hall in which were displayed the products of the company's Detroit, Paris, Cologne and Dagenham factories.

New models were comparatively rare at Brussels. Fiat introduced a new version of the rear-engine "600" passenger car as the Multipla six-passenger, all-service automobile. The Multipla is a development of the 600 introduced in the spring of last year and

Belgian Imports and Assemblies in 1955

Passenger Cars	Complete Units	Assemblies	Total 1955	Total 1954
Germany	4,792	35,067	39,859	36,150
France	2,053	23,795	25,848	18,522
United States	514	22,543	23,057	19,564
Great Britain	2,548	10,558	13,106	16,557
Italy	1,558	1,713	3,271	2,369
Czechoslovakia	452	746	1,198	363
Sweden	.....	387	387	289
Russia	54	.....	54	40
	11,971	94,809	106,780	93,854
Trucks				
Germany	1,741	4,831	6,572	5,245
France	308	2,641	2,949	2,832
United States	17	5,142	5,159	6,082
Great Britain	960	1,219	3,179	3,650
Italy	6	.....	6	23
Russia	48	.....	48	.....
Sweden	.....	695	695	686
Austria	.....	159	159	.....
Various	.....	.....	.....	83
	3,080	15,687	18,767	18,305



Suspension, steering, and power units of Fiat 600 Multipla

now representing more than 600 of the total output of 1000 passenger cars per day. The rear-mounted 38.6 cu in., 22 hp engine remains unchanged. The transmission provides four forward speeds and final gear ratio has been changed to 7.45 to 1.

To obtain accommodation for six passengers or a useful load of 770 lb with a loading space of 19 sq ft, the tread has been increased to just over 48 in. Wheelbase remains unchanged at 78¾ in., but the steering is carried completely forward, the front bench seat is directly over the front axle, and there are four folding seats. Another version gives a fixed bench seat in front and a fold-down bench seat behind it.

A Panhard cabriolet, built in the D'Ieteren body shops, was intended for the Belgian and United States markets. Until recently the Panhards were entirely light alloy construction but with a view to economy steel has now been substituted. On the cabriolet the hood and two doors were light alloy, but it was stated that plastic will eventually be used for these units.

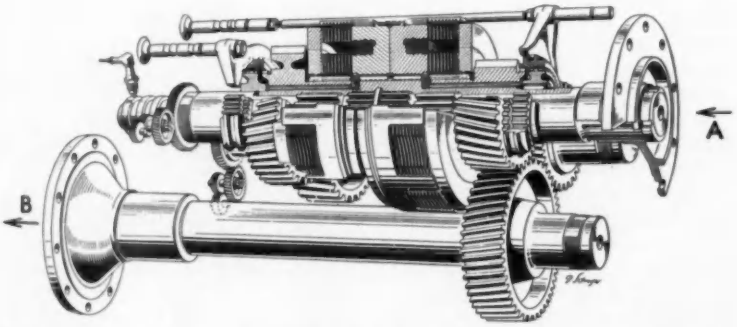
A surprise on the Chrysler stand was a four-cylinder Perkins Diesel in a Plymouth car. The engine of 192 cu in. piston displacement, develops 64 hp at 3000 rpm. This is the first American passenger car to appear on the European market with a heavy oil engine.

The Dutch Van Doorne Co. featured a three-ton 6 x 6 artillery tractor of unusual design. From a forward-mounted Hercules gasoline engine, power was transmitted through a five-speed gearbox to a two-speed transfer case which had a central differential. The transfer case housing was rigidly attached to the chassis frame members and at each end of the transfer case housing (and forming a part with it) bevel gearing transmitted the drive to the forward and rear propeller shafts. The final drive for both the front steerers and the pair of rear wheels was by means of enclosed overhead worm gearing. With this H layout all the driving mechanism was outside the main chassis frame members. The front wheels, which can be connected up by dog clutch to transmit the drive, are mounted on two parallel trailing arms, each of which is splined on the outer end of a transversely mounted torsion bar. The rear wheels on each side are mounted in pairs at the end of two parallel beams, the centers of which pivot around a box-section axle suspended by semi-elliptic leaf springs. There is no differential between wheels on the same side. The tractor has the usual military requirements for fording up to a depth of 30 in.

Van Doorne produces civilian trucks with the Leyland Diesel and has just taken out a manufacturing license for the six-cylinder 105 hp Leyland 0.350 III engine. Additional shops are now being erected.

Another 6 x 6 of unusual design was displayed by Tatra and featured a large diameter central tube chassis, with an aircooled 12 cyl forward-mounted engine. The cylinders were shrouded and each bank had its own fan. The two rear axles had half elliptic rear spring suspension and diagonally mounted quarter elliptics were used for the front. This general

(*Turn to page* 111, *please*)



Marine reduction and reverse gear made by Zahnradfabrik of Friedrichafen
A—Input shaft, B—Output shaft

KEYBOARD FOR POWER!

Turning at hurricane speed, the camshaft of an engine plays a powerful tune. Its finger-like cams spin in sequence, deftly controlling the explosive diet of each plunging piston. But to perform its important task, a camshaft must excel in many ways . . . and therein lies a story of castings. Quite some years ago, Campbell, Wyant and Cannon realized the wealth of benefits in store for engine user and engine manufacturer if a camshaft could be cast successfully. So CWC put engineering and research to work . . . developed special electric furnace alloys far superior to any previously used materials.

Since that time, CWC has delivered over 40 million cast camshafts . . . saved engine builders well over 50 million dollars. In addition to being produced at lower cost, these camshafts are heat treated to resist corrosion and wear for the life of the engine. They need little machining, are easier to machine and actually extend design possibilities of the engine.

It will pay to consider castings for your product. Many others have found the most important step is to contact CWC.

CAMPBELL, WYANT AND CANNON
FOUNDRY COMPANY
Muskegon, Michigan
GRAY IRON, ALLOY IRON AND STEEL CASTINGS

performance proven *by millions of installations*

- ***"No Kick-Out" feature wins overwhelming approval from car, truck and tractor manufacturers***

Although a comparatively new advancement in starter drive design, the Bendix* Folo-Thru Drive has already proven itself in millions of installations to be the most efficient starting equipment under all operating conditions.

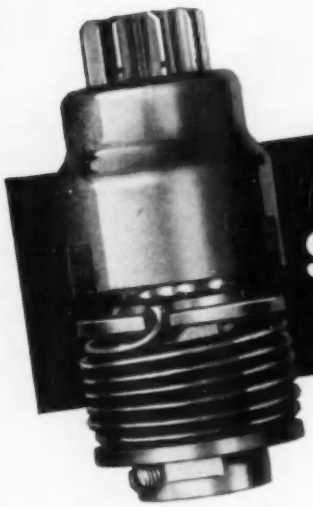
The Folo-Thru type is specially designed to follow thru the weak explosions until the engine actually runs on its own power. Thus, quicker and more dependable starts are assured even under the most extreme weather conditions.

You're right from the start when you specify Bendix Folo-Thru Starter Drive.

ECLIPSE MACHINE DIVISION OF Bendix
AVIATION CORPORATION
ELMIRA, NEW YORK

Export Sales: Bendix International Division, 205 East 42nd Street, New York 17, N. Y.

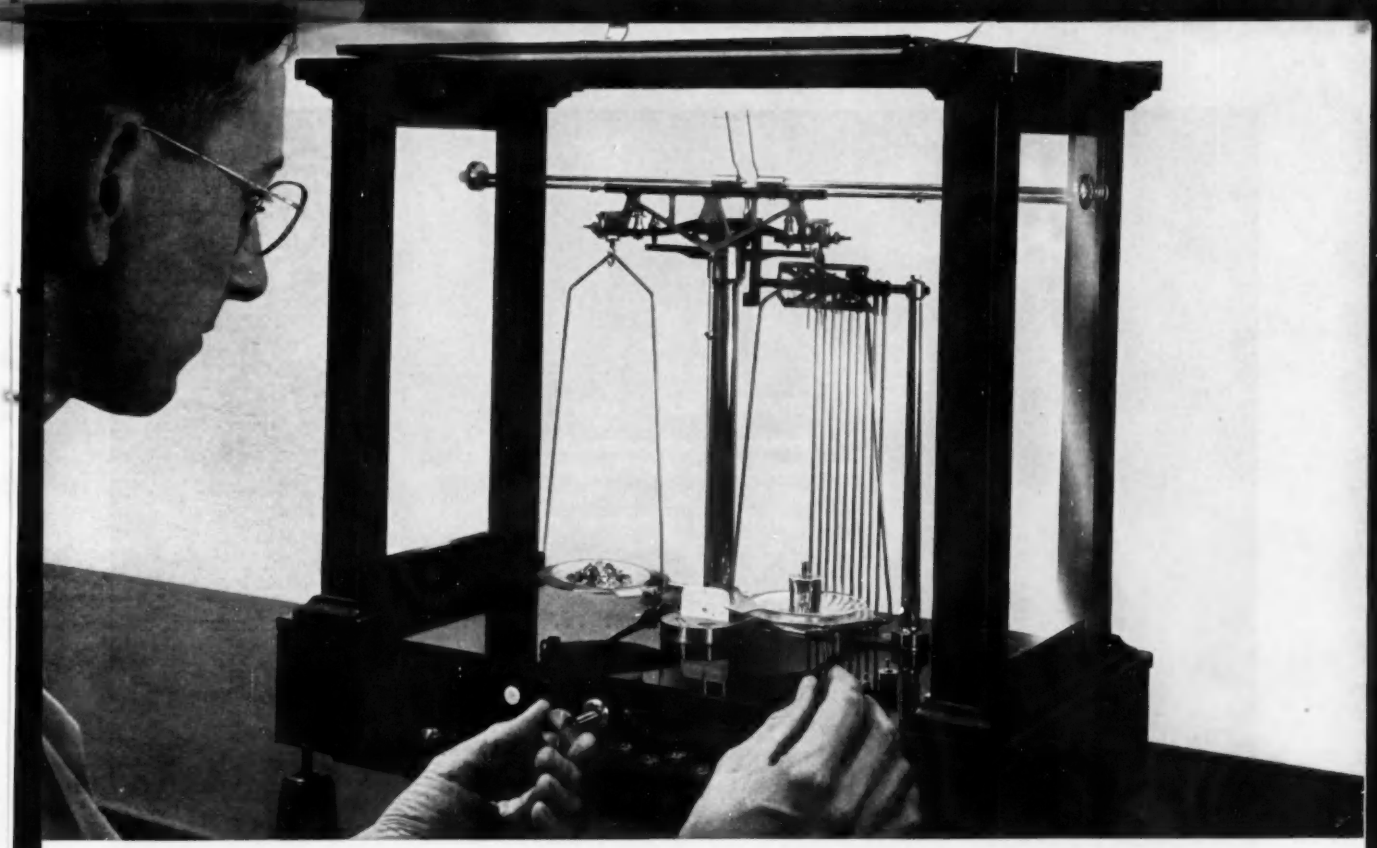
Bendix folo-thru starter drive



costs less—*Like the millions of Bendix Starter Drives manufactured for the industry, the new Folo-Thru Drive requires no actuating linkage, and the less expensive solenoid may be placed in any convenient position. Result is lower installation and maintenance costs. Complete detailed information is available on request.*

*REG. U.S. PAT. OFF.

Bendix* Folo-Thru Starter Drive Bendix* Automotive Electric Fuel Pump Stromberg* Aeroquad Carburetor



How Great Lakes Steel *weighs* quality

IN A QUALITY CONTROL LABORATORY, chemical analyses such as these, are run on every heat. Then . . .

THE ANALYSES are telautographed immediately to the melter so he can add elements to meet customer's requirements.

How much does quality weigh? In the photograph above, a test sample is being weighed for chemical determinations. Tests like this give our open-hearth operators a running check on molten steel while it is still in the furnace; enable them to pour heat after heat of high and uniform quality.

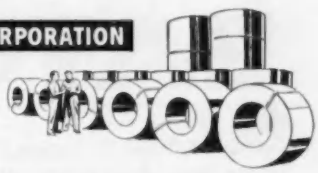
In every department at Great Lakes Steel, from raw material docks to delivery of finished steel, the emphasis is on quality—on seeing that customers receive steel that meets their particular requirements.

Do you have a manufacturing problem involving flat-rolled steel? A call to Great Lakes will make available to you the experience of our entire organization.

GREAT LAKES STEEL CORPORATION

Ecorse, Detroit 29, Michigan • A Unit of

NATIONAL STEEL CORPORATION

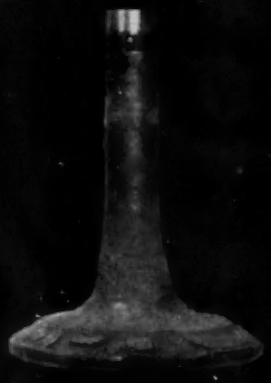


District Sales Offices: Boston, Chicago, Cincinnati, Cleveland, Grand Rapids, Houston, Indianapolis, Lansing, Los Angeles, New York City, Philadelphia, Pittsburgh, Rochester, St. Louis, San Francisco, Toledo, Toronto.

Performance Records Prove Eaton Free-Valves DO Last Longer!

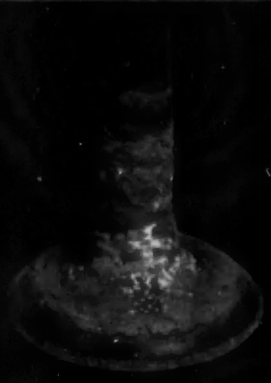
CONVENTIONAL VALVES

Failure unpredictable—anywhere between 5,000 and 40,000 miles. Impossible to set up dependable preventative maintenance schedule.



EATON FREE-VALVES

Still in good condition after 100,000 or more miles, permitting preventative maintenance scheduling. No in-between servicing necessary.



The Eaton Free-Valve is free of any restraining force set up by the valve spring. The normal creeping tendency of the valve causes it to take infinitely variable positions with respect to the seat at successive lift cycles.

The common goal of valve and engine manufacturers—and truck operators—is to obtain valve life equal to that of other major components, thereby eliminating the necessity for valve servicing between major overhauls. Performance records covering millions of miles of heavy-duty operation prove that Eaton Free-Valves have achieved this goal.

Eaton Free-Valves are genuinely "free"—free to turn at random in either direction, during a major portion of the lift-cycle. This free-floating action wipes stem and seat free of deposits; keeps a film of oil on stem and guide surfaces. Scuffing is prevented, wear is reduced. Hot-spots due to local leakage are eliminated. Longer valve life is a natural result.

Our engineers will be glad to explain how Eaton Free-Valves can be applied to engines of all types and sizes.

EATON

VALVE DIVISION
MANUFACTURING COMPANY
9771 FRENCH ROAD • DETROIT 13, MICHIGAN

PRODUCTS: Sodium Cooled, Poppet, and Free Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Jet Engine Parts • Rotor Pumps • Motor Truck Axles • Permanent Mold Gray Iron Castings • Heater Defroster Units • Snap Rings Springtites • Spring Washers • Cold Drawn Steel • Stampings • Leaf and Coil Springs • Dynamatic Drives, Brakes, Dynamometers

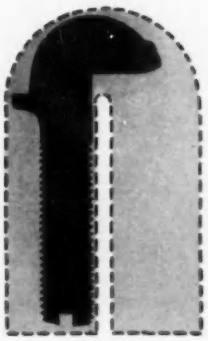
Eight operations cut to four

The old way:

The stud shown here was used by a tank manufacturer to blind feed into a tubing hole during assembly. Multiple diameters were required to hold the stud tight after insertion. To achieve this rather intricate shape, eight operations were originally required . . . until National was asked to study the problem.

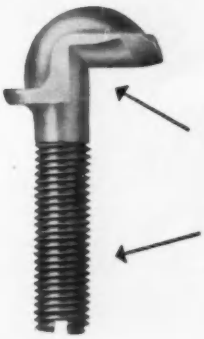
The National way:

Our "Special Products Service" showed this manufacturer how the stud could be produced to specifications *in only four operations* by cold-heading. Because National had the wide range of cold-heading equipment and specialized know-how needed to do the job, production costs were cut 50% . . . and substantial material savings resulted because cold-heading leaves a minimum of scrap.



OLD WAY

Bar stock bent in U-shape was machined to specifications in eight operations, with considerable waste of metal.



THE NATIONAL WAY

Head was upset into shape needed with multiple diameters.

Only four operations needed to complete stud by cold-heading and roll threading.

Bring your "Special" problems to National

Can we help you realize the same type of economy on *your* special fastener needs? Our "Special Products" representative will be glad to study your specifications. Write for free copy of National's "Special" fastener booklet.

Representatives in:
Chicago, Cincinnati, Detroit, New York, Philadelphia, Kansas City, Milwaukee, Rochester, Denver, St. Louis, San Francisco and Seattle.

THE NATIONAL SCREW & MFG. COMPANY
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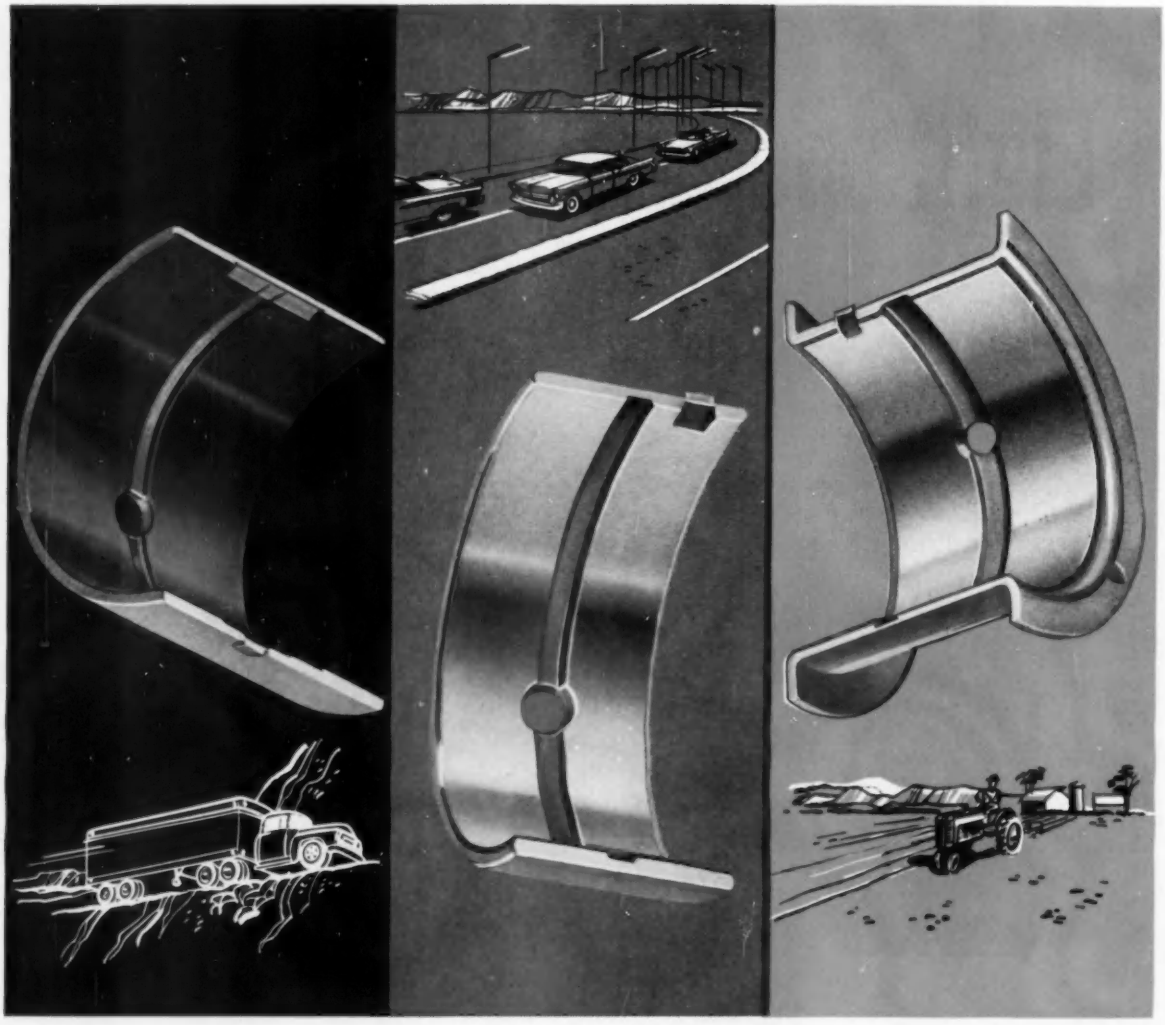
3423 South Garfield Ave., Los Angeles 22, Cal.

MANUFACTURERS OF PHILLIPS RECESS SCREWS

National PRODUCTS

Fasteners **Hodell Chains** **Chester Hoists**



RESEARCH • DESIGN • METALLURGY • PRECISION MANUFACTURING

Our 56 years of specialized experience is part of every one of the millions of sleeve bearings we produce each year. It means that each of these bearings will meet the most exacting requirements of practically every type of automotive, industrial and agricultural equipment. We maintain complete facilities for research and engineering, and quality control in all of our plants.

FEDERAL-MOGUL DIVISION

FEDERAL Mogul

SINCE 1899

FEDERAL-MOGUL-BOWER BEARINGS, INC., 11037 SHOEMAKER, DETROIT 13, MICHIGAN

News of the MACHINERY INDUSTRIES

By Thomas Mac New

Automation Equipment Industry Expanded by 10 Per Cent During 1955 and Is Expected to Increase by at Least as Much this Year

Automated Assembly

Ralph E. Cross, executive vice president of the Cross Co., says that automation for assembly operation is the next big thrust for builders of special machine tools. He stated that in 1955 the Cross Co. produced its first piece of automated machinery for the assembly of automobile engines. Since the threshold has now been crossed, Mr. Cross believes that in the next five years there will be a lot of assembly automation. "Today, we are only duplicating what is being done by hand," Cross states. As engineers design more and more for automation, there will be a rapid acceleration of progress in design. Pointing out the television industry as an example, he stated that components have been redesigned to conform to automated production. Other industries, he believes, are shifting to the same approach. In a year-end statement Mr. Cross estimated the automation equipment industry grew by 10 per cent during 1955 and will expand that much or more again in 1956.

Machine Tool Orders

The machine tool industry took orders for close to a billion dollars in machines during 1955, according to the National Machine Tool Builders Association. Sales during the year, which showed a record peace-time total, got an added boost in December when $157 million was booked for new orders. Right now the machine tool industry is working at a 7½ month backlog.

Blue Ribbon Exhibits

The ASTE has come up with a new idea so that visitors to the Tool Show will be able to quickly pick out the most significant developments. The idea is to display approximately 480 Blue Ribbons on outstanding productive equipment, automation, accessories, etc. Based on reports from over 70 per cent of the exhibitors to take part in the March 19 to 23 Show at Chicago's National Amphitheater, more than 28,000 items will be on display.

New G & L Setup

Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., has been reorganized into a divisional type setup. Giddings & Lewis will be the parent and will operate four divisions. Two of the divisions, G&L Hypro and Davis Boring Tool, will be in Fond du Lac; Cincinnati Bickford Tool will be operated in Cincinnati under the name of Cincinnati Bickford Div.; and the Kaukauna Machine Corp. will be known as the Kaukauna Machinery and Foundry Div. in Kaukauna, Wis. Each of the four divisions will be operated as a separate unit under a general manager. The general managers of the divisions are: Edgar R. McFerren, vice president and general manager of G&L Hypro; Allan L. McKay, vice president and general manager, Cincinnati Bickford; Erich C. Wussow, vice president and general manager, Kaukauna; and Erwin J. Kaiser, general manager, Davis Boring Tool. Mr. McFerren and Mr. McKay have also been named to the G&L board of directors.

Long Threaded Rod

Ex-Cell-O Corp. tells us that an Ex-Cell-O machine, a Style 120 precision thread grinder, was used for finish grinding a screw thread 40 ft long from solid steel stock. This thread—3½ in. in diam with a 0.750 in. lead—is a gothic type radius form designed for use with an antifriction circulating ball nut. Extra long screws of this type are widely used for actuator mechanisms in aircraft and for special machine tools. The workpiece is handled through a large hollow spindle. Four steady rests were used on the machine table with independently mounted rests beyond the table ends. To protect the thread already ground, when the ground section extended beyond the machine, an antifriction ball nut support was utilized. The screw was divided into five sections. Three sections were done from rough to finish in the initial setup. Then the part was turned end for end and the two remaining thread sections were ground to complete the job.

NMTBA Appointments

From Abrasive Machine Tool Co., East Providence, R. I., it is reported that Joseph T. Vinbury, sales manager, has been appointed by the Machine Tool Builders Association to head its sales conference committee. As chairman, Mr. Vinbury and his committee will start planning for the Machine Tool Builders sales conference to be held sometime this year at one of the Nation's leading universities. The conference will be a two-week seminar conducted for members by a faculty of sales, marketing, and advertising authorities. Another NMTBA appointment of an executive of Abrasive Machine, deals with the choice of N. Douglas Macleod, Jr., executive vice president of Abrasive, to the Association's tax subcommittee. Mr. Macleod's appointment automatically provides membership on the NMTBA Government Relations Committee.

Around the Industry

Sheffield Corp. recently purchased Erwin A. Slate, Inc., a machine tool sales and service engineering company, at Gasport, New York. It will operate as a wholly-owned subsidiary of the Sheffield Corp. Louis Polk, president and chairman of Sheffield, said that the Slate Co. will be the operating agency of Sheffield Corp. for the entire area of upper New York state.

U. S. Axle Co., Inc., Pottstown, Pa., has installed completely new production equipment to improve its facilities for the manufacture of axle shafts in the industrial machinery field. The equipment includes such items as heavy duty production lathes with 20 in. swing and 85 in. centers. The company has also pur-

(*Turn to page* 184, *please*)

NEW PRODUCTION and PLANT EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

Unloading a finish shaved truck transmission clutch gear from a Red Ring planetary shaver.

Shaver Produces Thin-Tooth Shapes

THIN-TOOTH sections in the flanks of spur gear teeth are produced by a process carried out on the newly-designed model PSA-4in. Red Ring planetary gear shaving machine. The process was developed to meet the needs of transmission builders for a high-production method that would produce spur gear thin-tooth sections having uniformity; accuracy of form, depth, width and concentricity; a high quality surface finish; and a sharp step at the edges of the section. A variety of thin-tooth section edge shapes can be produced by the process. The thin-tooth section can be made on either one or both sides of all of the teeth of a spur gear. The profile of the section produced closely approximates an involute form and is said to be usually within required tenths of a thousandth involute profile tolerances.

The shaver has a hardened and ground HSS cutter that resembles an internal spline. A gear, whose teeth are to be thinned in a given flank section, is mounted in a three-jaw gear tooth chuck in mesh with the cutter. The work gear rotates around the cutter centerline during the shaving process. Thus the gear is rotated about an axis in mesh with the cutter during the shaving operation in much the same manner that a planet gear runs with an internal gear in a planetary gear set.

Since the cutter has single cutting edges, which alternately thin first one side of all the teeth and then the other, a timed relationship is maintained between the gear and the cutter. This is achieved by locating the gear radially in the toothed chuck jaws and rotating the chuck about the cutter centerline with a master gear and internal gear assembly located in back of the cutter. If desired, the gear can be mounted on a work spindle and located radially with a single tooth locator.

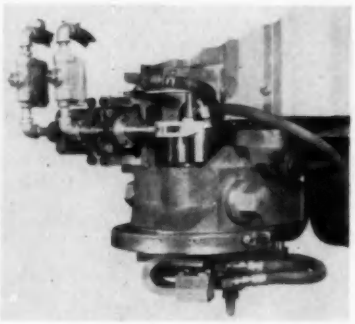
At the loading position, the gear is located in such a manner that it is in backlash position with respect to each of the cutting edges of the planetary shaving cutter. When the automatic cutting cycle is initiated, the gear axis is rotated about the cutter center line and the cutter is fed tangentially in increments, first in one direction, next back to backlash position, then in the opposite direction and finally back to backlash position for unloading.

The gear being loaded into the shaver in the illustration is a 3¾-in. OD, 1 9/16 in. wide, 25-tooth, 7-pitch, 20 deg pressure angle truck transmission spur tooth clutch gear. A 3/8-in. wide, 0.010-in. deep section with a sharp step is produced in each tooth flank by the process. *National Broach and Machine Co.*

Circle 25 on postcard for more data

Welding Guide

THE stitch welding head is designed to guide spot welding electrodes to achieve contoured seam welds previously unobtainable. Either spaced or overlapping spots on any contour pattern may be used. The stitch head may be mounted on any press welder, and replaces the upper electrode. Features include: indexing head fully water-cooled for high production, operating speed up to 100 spots per minute, dependent on material being welded, full 360 deg rotation. Maximum radius of pattern is three in., minimum is ½ in. *Taylor-Winfield Corp.*

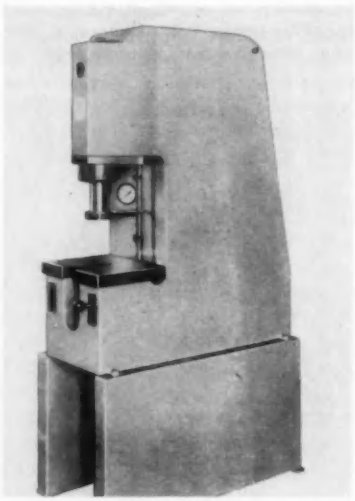


T-W welding head guide.

Circle 26 on postcard for more data

Press Line

HIGH speed hydraulic presses for fast production, operate at up to 520 ipm closing and return speeds. Controls are sensitive to the touch, yet the ram can be slowed down or stopped at any point. At the bottom of the work stroke the hand or foot may be removed from the control, and



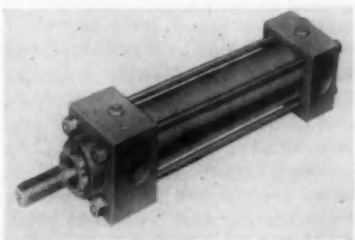
Northern hydraulic press.

the ram will return to a predetermined setting. Presses are made in 10 and 20 ton capacities. Length of stroke can be set from ½ to 12 in. They are, available hand, safety dual-hand or foot controlled. Ten-ton size can be furnished electrically controlled. *Northern Tool and Machine Co.*

Circle 27 on postcard for more data

Cylinders

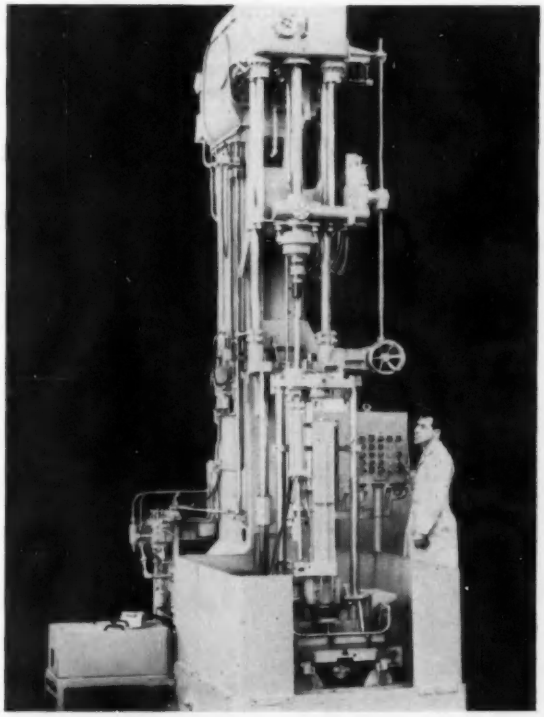
THE Ultra-mation line of nonrotating, double-acting, square-end cylinders is now offered for general use. Previously this cylinder has been built only as special for difficult high-production jobs. Basic specifications



Ultra-mation double-acting cylinders

are as follows: five bore sizes from two to six in.; pressures to 150 psi air—to 500 psi oil. There are five basic mounting styles—foot, trunnion, flange, clevis, pivot — with interchangeable covers permitting multiple mounting combinations. Covers, both front and blind end are of heavy steel plate; Piston rods are extra-heavy to carry high impact loads and have highly polished surfaces. Rod wipers are of durable synthetic rubber. Cylinder tubes are hard-drawn and corrosion-resistant. Pistons are of high-quality steel construction. Ports of adequate size can be relocated to any 90 deg position by rotating cylinder covers. Tie rods are extra-heavy to resist shock loads and to maintain proper tension on cover gaskets. Cushioning is available for either or both cylinder ends as specified. Cushioned or noncushioned cylinders have same mounting dimensions. *Logansport Machine Co.*

Circle 28 on postcard for more data



The Micromatic model 450 machine, equipped for internal and external microhoning, has a maximum 50-in. hydraulic head stroke and a work diameter capacity of 15 in.

Microhoning Machine Has 50-In. Stroke

THE new model 450 Hydrohoner has a maximum 50-in. hydraulic head stroke and a work diameter capacity of 15 in. Equipped with an eight-speed transmission, variable delivery hydraulic pump and tank unit and controls, and a safety interlock to hold the head in the up position, this machine may be obtained with either remote control manual feed or automatic hydraulic tool expansion.

In an installation just completed in a plant manufacturing precision recoil mechanisms, it has been adopted to an ID-OD application. After the ID honing of the recoil cylinder, the table moves out to clear the spindle for the OW honing of the floating piston rod. For ease of loading and inspecting, the internal honing fixture has a tilt-down feature. The rod, keyed to the spindle in the upper end and mounted on a live center at the bottom, is rotated and reciprocated through the OD tool.

In removing approximately 0.025 in. stock from the cylinder and 0.006 in. stock from the rod, a geometric tolerance of 0.0001 in. is held while obtaining a 1.5 microinch finish. *Micromatic Hone Corp.*

Circle 29 on postcard for more data

NEW PRODUCTION and PLANT EQUIPMENT

Simulates Hand Lapping

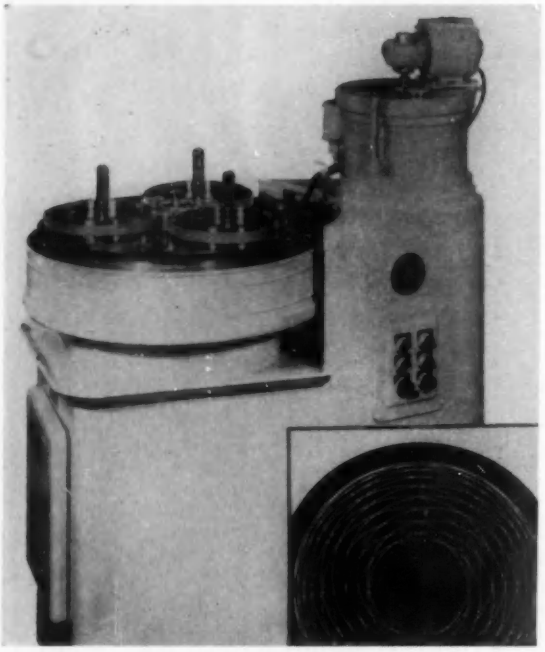
THE exacting motion hand lappers use to attain fine finishing is automatically simulated in the new Gyro-Matic "21" lapping machine developed and being marketed.

The center drive gear operates with an eccentric motion that simulates a "figure 8" path which is then followed by the piece parts across the surface of the lapping plate.

This motion coupled with other features is claimed to achieve optical flatness to one light band (0.0000116 in.).

This new method of exact flat lapping is particularly suited to volume production of materials. Additional innovations include: positive counter-motion which rotates parts to be lapped against the motion of the lapping plate; six precision sealed ball bearings that support the lapping plate; and a new type agitator operating on its own motor to keep abrasive compound in correct suspension. *Spitfire Tool Co.*

Circle 30 on postcard for more data



Push button - operated lapper is automatic after pilot test run.

Miniature Flag Indicator

MINDICATOR is the name of a hermetically sealed miniature indicator designed to feature high readability, extremely small size, and excellent vibration resistance. A unique rotating disk dial allows maximum display area of colored flags in quadrant-type mask openings of 90 deg or less. This makes possible a confusion-proof presentation of alarm, malfunction, position or other information. The device has a face diameter of only ¾ in., body diameter of 13/16 in. and over-all front-to-back depth of 1 17/64 in. It is constructed to meet the vibration requirements of MIL-E-5272A Procedure I. It is available in all sensitivities normal to moving coil dc instruments. Pointer type also available. *Marion Electrical Instrument Co.*

Circle 31 on postcard for more data

Marion Mindicator.

Precision Gaging

THE direct setting electrolimit external gage is described as ideal for gaging parts of similar but different sizes, for gaging several dimensions on a single part, for use as a comparator on short runs involving a few to a few hundred parts, and for a variety of other precision inspection and gaging jobs. Said to be capable of quick, easy setting direct to 0.0001 in. without the use of masters, this gage also gives comparative readings, over or under the dimension set, direct to 0.00005 in. on a full scale of ±0.001 in. Total range of the gage is six in.; repeatability is with 0.00005 in.

Electolimit Gage

Standard gage blocks are used to set the gage for even inches. Fractional inch settings are obtained by operating a handwheel that elevates the gage head through a precision micrometer screw. The desired setting is read direct to 0.0001 in. on the setting counter. Re-setting within the established inch range is accomplished by turning the handwheel as required.

Combining the adaptability and versatility of the ordinary, direct setting gage with the gaging speed and ease of the comparator, the new gage is expected to fill the need for an instrument capable of handling the many gaging jobs that fall between the scope of these two basic types. *Pratt and Whitney Co., Inc.*

Circle 32 on postcard for more data

Rectifier Improved

RECTIFYING units for plating now integrate a sensing panel which consists of a dc magnetic amplifier physically coupled to the output dc bus bar. Any variation in output current (amperes) will effect an amplified variation of voltage on other windings of the magnetic amplifier.

The variable voltage obtained from the magnetic amplifier is injected in a balanced bridge circuit. The resultant output of this bridge will vary a motor driven Inductrol. A sensitive meter-relay energizes a raise-lower relay which in turn operates this motor-driven Inductrol in either direction.

These rectifier units automatically increase the output voltage as the load or current demand is increased. Thus a greater degree of constant current density is obtained. Developed for automatic plating operations, its use can be extended to other electrolytic applications, where a greater degree of constant current density is required. The amount of voltage increase with increasing load may be pre-selected by a simple control which is normally pre-set.

In operation, during a fully automatic plating cycle, the first rack or piece of work requires a lower voltage in order to prevent burning. As the succeeding racks are added to the solution the voltage requirement increases in order to maintain a required current density in all the work.

Similarly at the end of a plating period, when the remaining pieces near the end of a plating cycle, the voltage requirements diminish, necessitating a lowered voltage again to prevent excessive current density. Panels can be incorporated in rectifiers ranging in outputs from 500 watts to 500 kw. *Rapid Electric Co.*

Circle 33 on postcard for more data

Air Valve

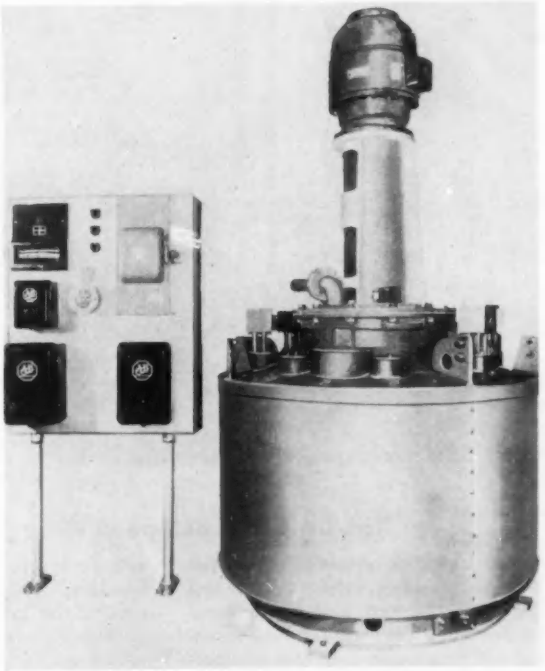
THREE-POSITION, four-way double solenoid air valves have just been introduced, featuring a neutral position and available with either open or closed centers. On the open center model No. 1013 both cylinder ports are open to exhaust and pressure is blocked when solenoids are de-energized—leaving the cylinder rod in a free state. When energized, one port opens to line pressure, the other remains open to exhaust. Ports of the closed center model No. 1023 are blocked from pressure and exhaust when solenoids are de-energized, holding the rod in a locked position. When energized, one port opens to pressure, the other to exhaust. Both models are currently available in ⅜ in. I.P.S. Side porting is standard, however, bottom ports are available upon request. *Mechanical Air Controls, Inc.*

Circle 34 on postcard for more data

Dies Heated by Salt System

TEMPERATURES up to 1000 F can be produced at no pressure by the "Beth-Tec" unit, employing eutectic heat transfer salt marketed by du Pont under the name "Hi Tec." The system was especially designed for heating metal-forming dies. Close control of temperature can be maintained at the point of application.

The heat transfer medium has negligible vapor pressure. It is nontoxic, noncorrosive, nonfouling; is chemically stable and inexpensive.



Beth-Tec salt heating system for dies.

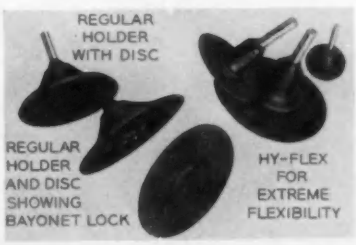
The units, which are manufactured by Bethlehem Foundry & Machine Co., come complete with salt pump, tank, piping and instrumentation. These units are available through *American Hydrotherm Corp.*

Circle 35 on postcard for more data

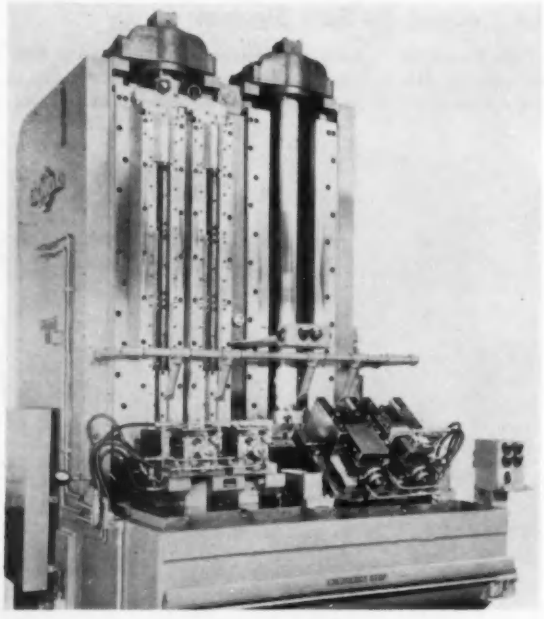
Polishing Disks

CONTUR coated abrasive disks and flexible rubber disk holders are said to be ideal for grinding and polishing all surfaces, flat to extreme inside or outside contours. They follow the surface, grinding cleanly and without gouging. Disks are self-centering, balanced and bayonet lock firmly on the holders with a twist of the wrist. There is said to be no loosening from heat caused by grinding. *Foster Supplies Co.*

Circle 36 on postcard for more data



Contour disks are available in popular grits from 24 to 320 and in six sizes, ¾ to four in.



Equipped with automatically actuated tilt-up fixtures, this 15-ton, 66-in. stroke, ram machine broaches half round and mating faces of connecting rods. Production rate is 550 per hour, broaching two at a time on each ram.

Tilt-Up Fixtures Speed Broaching

AUTOMATICALLY actuated tilt-up fixtures speed broaching of connecting rod half rounds and mating faces by providing easy loading and operator safety, according to an announcement. This setup is said to enable a major automobile manufacturer to produce 550 pieces per hour on a single machine and 27,000 pieces per broach sharpening. Fixtures are mounted in duplicate on a 15-ton, 66-in. stroke model RT dual ram broaching machine.

During loading, machine table is in full rear position with fixture tilted upward approximately 45 deg toward operator. Operator drops two connecting rod forgings into fixture. No positioning is required because tilt of fixture allows parts to slide under locators. To start cycle, operator depresses overhead palm buttons thus closing clamps and starting machine table forward. As table and fixture move in, a roller bearing in a cam track tilts the fixture into cutting position. Interlocked controls then actuate the ram for the cutting stroke. At the end of cutting stroke, cycle is reversed. Machine table moves outward, tilting fixture into unloading position and releasing clamps. Spring ejector pushes broached parts into finger clear space, facilitating unloading.

Each fixture holds two parts and two fixtures are used. This enables four connecting rods to be broached in one complete machine cycle. One fixture on the dual ram machine is in cutting position while the other is being unloaded. *Colonial Broach and Machine Co.*

Circle 37 on postcard for more data

Air Motor

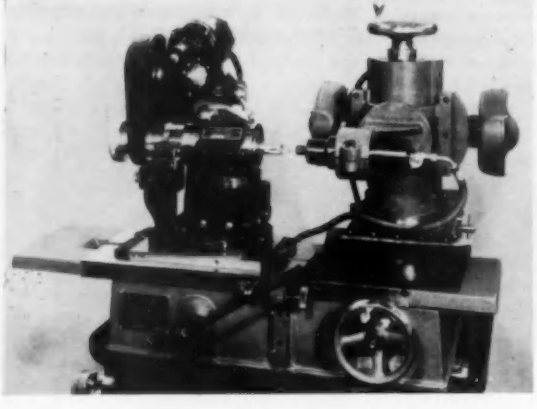
THIS air powered hand tool is designed expressly for drilling and countersinking close tolerance holes in one operation. Quickly changeable spacing feet eliminate the need of drill jigs, straps, and fixtures.

Spacematic air tool

In operation, the collet in the foot of the Spacematic tool is inserted into a previously drilled hole, and the tool is aligned to the work. Upon pressing the trigger the collet is expanded and drawn, clamping the tool rigidly to the work. The drill is then power fed into the work. The maker reports that ¼ in. diam holes, with a 0.500 in. diam countersink, are drilled in five seconds through ¾ in. 75 ST aluminum alloy. Adjustments are provided for rate of drill feed and for drill countersink depth. Close reamer (tolerance) holes can be drilled on a production basis with this tool without subsequent reaming operation. *Winslow Product Engineering Corp.*

Circle 39 on postcard for more data

Internal Grinding Attachment

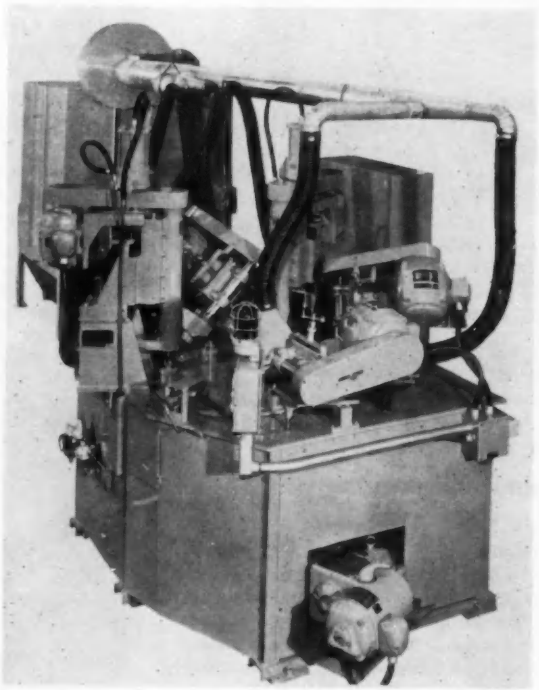


For form grinding internal cutting edges of hollow mills, trepanning cutters, etc., an internal grinding attachment has been introduced for the R-O universal form relieving fixture. Angular external surfaces of small cutters that cannot be conveniently ground with large wheels can also be form relieved with the device. (Royal Oak Tool and Machine Co.)

Circle 38 on postcard for more data

Automatically Deburrs Broached Parts

AN automatic machine has been developed for deburring multi-slotted, broached parts. In operation the gear or part is placed on an expanding collet which holds it in place while it moves around an automatic indexing table. The part travels through five brushing stations and is indexed into four different positions, thus presenting all sides of the chucked part to the brushes. The machine uses five brushes which are made by driving a heavy wire staple through a round steel channel to anchor each tuft individually. These crimped steel wire brushes are eight-in. diam and revolve at about 3000 rpm.



This Fuller machine was designed to deburr 200 multi-slotted, broached parts in one hour. The piece moves around an automatic indexing table and passes through five brushing stations so that all sides of the chucked part can be reached by crimped steel wire brushes.

Their penetration of the work is approximately 0.060 in. The brushes can be adjusted to compensate for wear by turning hand wheels at each brush station. Each brush is driven by a one-hp motor. In dry brushing, the metal particles are drawn off by a vacuum system, using hoods about the brushes for the purpose of carrying off the chips.

Each machine is designed to deburr a special gear or part. Test work is done in the firm's laboratory to determine the proper brush speeds, material and penetration necessary in each case. *Fuller Brush Co.*

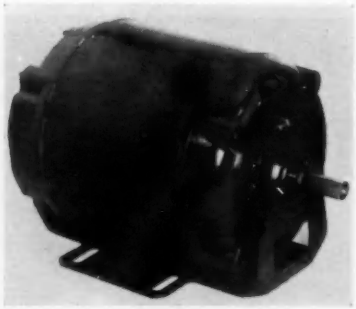
Circle 40 on postcard for more data

Small Motors

THE 1/20 to ⅓ hp 48-Frame motor line offers weight and space savings with no sacrifice of industrial ruggedness, according to company spokesmen. Test reports indicate that the improved design and new materials used make it superior to old-style larger motors.

Among innovations in the smaller, lighter motor is high-pressure-cast aluminum end brackets, precision machined and stress-relieved for permanent dimensional accuracy. For cooling, the motor features an integrally-cast, cluster-type aluminum fan. The square stator iron allows space for a blast of cooling air to pass between the frame and the core, and to cool the whole core width. The standard frame is drip-proof. *Century Electric Co.*

Circle 41 on postcard for more data



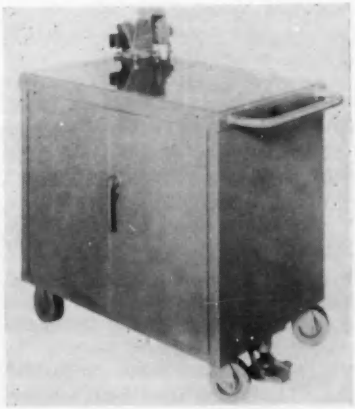
Century 48-frame motor

Mobile Workbench

A HEAVY-DUTY portable workbench that can be used for maintenance, assembly, repair and other similar operations has been developed to meet needs for a mobile unit containing tools that can be moved by one man to work locations. The bench has a cabinet, three shelves, a drawer, plus two doors that can be locked shut. An extension cord and plug-in connection can be furnished to facilitate use of electrical tools. Utilization of the bench gives portability to many shop tools such as small drill presses, etc.

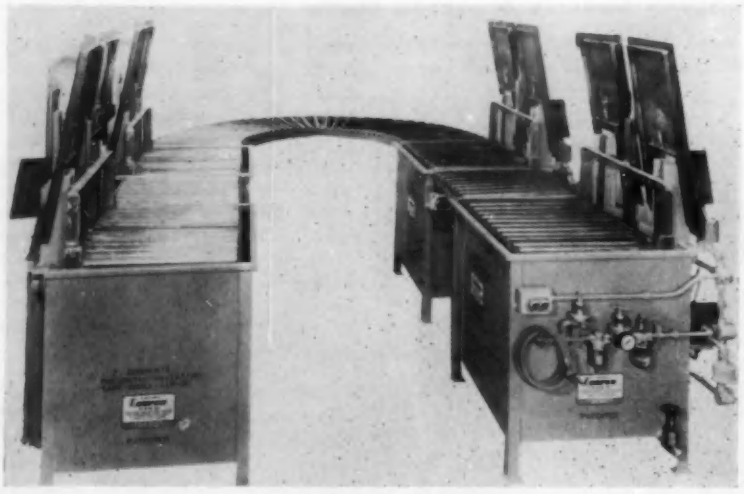
The standard unit shown is 34 in. high (not including vise), 41 in. long and 26 in. wide. Table top is 24 by 36 in. Mobile workbenches can be supplied in various sizes to meet individual requirements. *Overbeke-Kain Co.*

Circle 42 on postcard for more data



Overbeke-Kain mobile workbench

NEW PRODUCTION and PLANT EQUIPMENT



Cooper automatic conveyorized machines showing conveyor system with drip pan between each machine

Conveyorized Cleaning and Dipping

AUTOMATIC conveyorized machines which give automation for metal cleaning and dipping operations, are designed for metal cleaning with petroleum solvents, alkalis, emulsion cleaners and other types of commercial metal cleaning and paint stripping solutions. The machines are also designed for rinsing, rustproofing and various preparatory and coating operations.

They are furnished in different sizes to handle various cleaning and dipping operations. Small parts are cleaned in baskets, which are conveyed from one tank to another, and large parts, such as heavy castings and motor blocks, are individually cleaned and conveyed through the various cleaning and rinsing stages. Parts are loaded flush with top of machine, at a normal working height of 3 in., minimizing lifting.

Operation is relatively simple. By pressing button, loaded rack automatically lowers to bottom of machine and the agitation begins. After desired agitation cycle, by pressing second button, agitation stops and loaded rack rises flush with top of machine for next operation. Agitation is automatic, not requiring the services of an operator except to load and unload. Where complete automation is required, machines can be furnished with solenoid relays and cam operated timers to automatically load, unload, and convey baskets or parts from one operation to the next.

The machines are equipped with a deadman's control in addition to automatic fusible closing device on covers. In the event of a fire, the deadman's control automatically sends the rack to the bottom of the machine, permitting the lids to automatically close.

The machines are furnished in heated or unheated models and can be furnished without conveyors where only one or two machines are required. When required, the machines can be equipped for soak cleaning in conjunction with the agitating feature. *D. C. Cooper Co.*

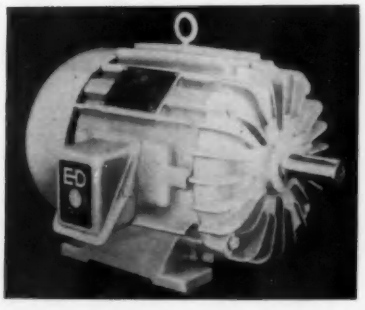
Circle 43 on postcard for more data

Totally Enclosed Motors

IMPROVED rerated, totally enclosed, non-ventilated and fan cooled motors conforming to the dimensional standards recently adopted by NEMA, have been placed in production. The motors have been designed more compactly than previous NEMA design, utilizing less space and larger horsepower output. The housing and end-brackets are constructed of solid cast iron, ribbed frame. This new line, designated as type H, is designed for operation where non-combustible dust and moisture are prevalent. Motors are in production on the 182, 184, 213, 215, 254U and 256U frames. Larger ratings will be available in the rerated frame sizes in the next few months.

Previous design NEMA frames 203 through 505 totally enclosed, fan cooled, are still being produced. *Electro Dynamic Motor and Generator Div., General Dynamics Corp.*

Circle 44 on postcard for more data

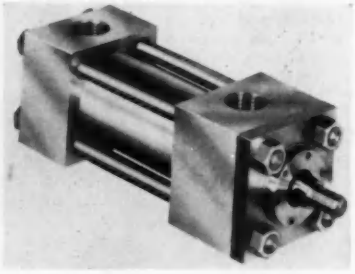


Electro Dynamic motor

Hydraulic Cylinder

A HEAVY-DUTY hydraulic cylinder, rated at 2000 psi, has been added to the firm's line. It is said to meet JIC standards and to be built for dependable performance under severe industrial operations.

Specifications and featured items include: Heavy walled seamless steel tubing micro-honed for minimum friction; rolled steel heads recessed to confine the tube, prevent breathing and provide additional protection against leakage; piston rods hard chrome plated, turned, ground and polished from stress relieved high tensile steel; multiple lip self-compensating rod gland packing providing pressure sensitivity with long life. This packing is contained in a removable cartridge which facilitates replacement without disassembling the cylinder. *Ortman-Miller Machine Co.*



Ortman-Miller hydraulic cylinder

Circle 45 on postcard for more data

Air-Loaded Tester

AN air-operated, semi-automatic Brinell hardness tester provides positive application of standard loads of 500, 1000, 1500, 2000 and 3000 kg. The gage mounted at the top of machine shows exactly what load will be applied before the test is made. To use the Air-O-Brinell, the operator simply adjusts the air pressure regulator valve until the desired Brinell load is indicated on the gage. Once the load is set, any number of hardness tests can be made in rapid sequence. Load is applied by pulling out the plunger-type control valve and released instantly by pushing it in.

The machine need only be attached to a standard compressed air supply. Fluctuations in air supply pressure above 65 psi will not affect accuracy of the machine. *Tinius Olsen Testing Machine Co.*

Tests indicate the Air-O-Brinell is as fast and in many cases faster than conventional motordriven machines.

Circle 46 on postcard for more data

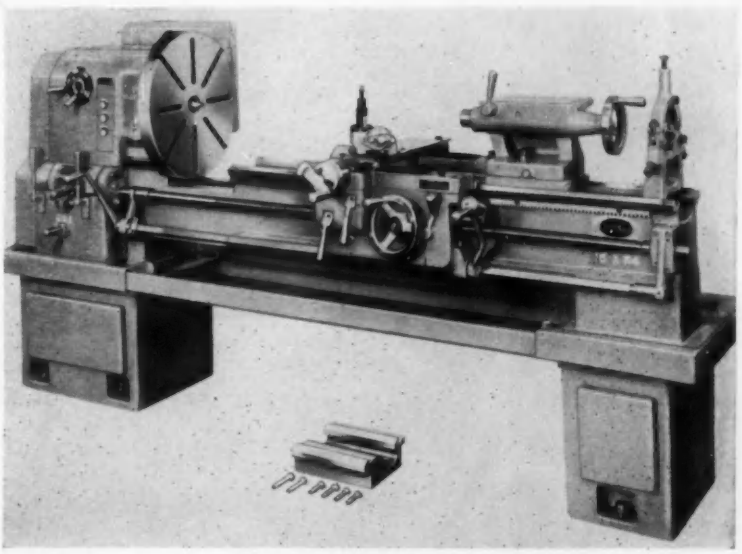
Air Line Lubricator

CALLED the Airliner, this new air line lubricator atomizes the oil in a chamber remote from the air line. Oil mist is injected into the air stream, metered in particles fine enough to approach the lightness of air itself, so that the particles travel farther along the air line. Heavier particles fall back into the oil reservoir. Whereas oil drops injected into the air stream reportedly provide lubrication in densities and cycles varying with the frequency of the drops, the Airliner's mist is said to provide constant lubrication throughout the entire operational period, with every particle of air carrying some lubricant. This constant, even lubrication is said to save maintenance (filling) time because the oil is consumed more slowly to achieve comparable lubrication.

Operation of the lubricator is monitored through the transparent dome of the mist generator. Additional advantages featured are that it can lubricate any volume of air, from ¾ cu ft up to capacity of the air line; that it provides lubrication regardless of cycle frequency; and that its operation results in a smaller drop in air line pressure, regardless of air volume and pressure. *Gits Bros. Manufacturing Co.*

Gits lubricator

Circle 48 on postcard for more data



Cincinnati Model LE fixed gap bed lathe

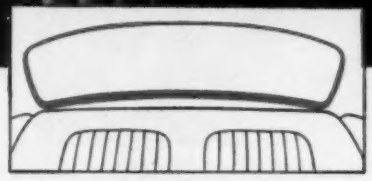
Versatile Fixed Gap Bed Lathes

NEW, all-geared head, model LE fixed gap bed lathes in 15 in., 18 in., 21½ in. and 26 in. sizes are announced. The machines are said to provide extra versatility because oversize workpieces may be accommodated by removal of the gap block, which increases swing size to 22 in., 27 in., 32 in., and 37 in., respectively.

They have 12 spindle speeds in geometric progression, with a 3-lever, direct-reading shift mechanism. Forty-eight thread and feed changes on the 15 in. and 18 in. lathes, and 54 thread and feed changes on the 21½ in. and 26 in. lathes are made available through a totally enclosed, automatically lubricated quick change gear box. The 15 in. and 18 in. size lathes are offered with a three hp motor, and the 21½ in. and 26 in. lathes with a five hp motor, mounted on the rear of the headstock leg for ease of maintenance.

Tray-tops on headstock and tailstock provide convenient parking space for micrometers, tools, drawings, gages, and other accessories. *Cincinnati Lathe and Tool Co.*

Circle 47 on postcard for more data



Dodge selects Enjay Butyl rubber for big rear-window weatherstrip

Super-durable Enjay Butyl fits perfectly Dodge's rigid specifications for its rear-window weatherstrip. Under the toughest conditions of weather and use, Enjay Butyl parts stay like new, help add style and color to new cars. In fact, some automobiles have more than 100 parts made of this fabulous rubber.

The many advantages of Enjay Butyl make it the almost perfect rubber for the automotive industry. Its price and ready availability are advantages, too. And it is now available in non-staining grades for *white* and *light-colored* parts. For full information and for skilled technical assistance in the uses of Enjay Butyl, contact the Enjay Company at either of the addresses below.

ENJAY

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Free INFORMATION SERVICE

Use either of these postcards for Free Literature listed below, or for more information on New Production Equipment and New Products described in this issue.

USE THIS POSTCARD

FREE LITERATURE

Conveyor Idler 1

Bulletin 20-60 describes a flexible belt conveyor idler called the Limberoller that shapes itself to the load and uses only two bearings. *Joy Manufacturing Co.*

Speed Reducer 2

The HVUT universal change-gear reducer has been developed specifically for application to conveyor drives. Descriptive folder is available from *Philadelphia Gear Works, Inc.*

Honing 3

Catalog 550 covers broadly the subject of honing, including application, various types of machines, tools, abrasives, fixtures and coolants. *Barnes Drill Co.*

Hi-Temp Wire 4

A new bulletin on silicone rubber high-temperature wires for the aircraft industry contains descriptions, dimensional and other construction data, and physical and electrical properties. *Construction Materials Div., General Electric Co.*

Grinders 5

Precision cylindrical grinding machines, exhibited at the Machine Tool Show, are illustrated in a 20-page booklet. Included are photos and descriptions of integrated production lines, automatic grinders and standard machines. *Landis Tool Co.*

Straight Side Presses 6

The complete capacity-range of series D double-action straight side presses, with latest design features and improvements, is shown in an eight-page illustrated catalog published by *Danly Machine Specialties, Inc.*

Machining Blades 7

Precision machining of jet engine compressor and turbine blades, including profile milling, grinding and polishing, are described in a new bulletin, 50620-A. *Ex-Cell-O Corp.*

Production Line 8

Production line layout, combined with automatic mass machining methods to reduce automotive cylinder head costs and increase production, is described and illustrated in a seven-page fold-out brochure recently released by *W. F. & John Barnes Co.*

Electric Steel 9

Revised booklet, 28 pages, on "Electrical Steel Sheets and Coiled Electrical Steel Strip" (Technical Bulletin EM 21) is now being distributed by *Allegheny Ludlum Steel Corp.*

Sealing 10

A new edition of the Presstite Autobody Sealers Catalog covering nine products has just been issued by the *Presstite Engineering Co.*

(Please turn page)

VOID After Apr. 15, 1956 **2/15/56**

Circle code numbers below for Free Literature, New Plant Equipment, or New Product Information

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
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Induction Heating 11

A descriptive bulletin, No. 85-843, on the general purpose scanner (Type GP) for scanning or single-shot heating of work pieces up to 30 in. long, 10 in. diam is offered by the *Westinghouse Electric Corp.*

Mounts 12

Heavy-duty general-purpose steel spring vibration mountings are described in catalog SS-55 just released by *T. R. Finn & Co., Inc.*

Wire Boxes 13

Ways to cut material handling costs with new steel wire mesh Cargotainers are described in a revised attractive 28-page brochure now being offered by *Pittsburgh Steel Products Co.*

Hydraulic Valves 14

Bulletin 101 describes 16 different hydraulic valves for aircraft, industrial and mobile uses. *Electrol, Inc.*

Cutting Oil 15

A versatile transparent non-emulsifying cutting oil, Sunicut 5534, designed for use on a wide variety of steels, is described in bulletin 39. *Sun Oil Co.*

OBI Presses 16

A complete line of inclinable presses from 10 to 200 tons, and in both standard and enclosed design, is described in new 32-page catalog 2D just issued. *E. W. Bliss Co.*

USE THIS POSTCARD

Speed Control 17

The Ampli-Speed magnetic drive reportedly provides precise, adjustable speed power for a wide range of applications. Four-page folder No. 4400-PRD-229 explains use of the drive for both fan-type (centrifugal fans, pumps, compressors) and constant torque loads (conveyors, mixers, machine tools, etc.). *Electric Machinery Mfg. Co.*

Stainless in Trucks 18

What stainless steels are doing for the trucking industry is the subject of an article in the newly released Vancoram Review, publication of the *Vanadium Corp of America.*

Tracer Lathe 19

A tracer lathe that features top mounting of both the tracer slide and template is covered in four-page bulletin HDT-55 available from *Hydra-Feed Machine Tool Corp.*

Formed Shapes 20

An illustrated story of the production of roll formed shapes is told in 26-page catalog No. 1555. Processes shown include the notching, punching and cutting to length of special shapes in one continuous operation. Also contained are drawings and dimensions of more than 100 simple and complex shapes, lockseam and butted tubing angles and channels now being produced. *Roll Formed Products Co.*

Disk Grinder

A new catalog illustrating and describing the newly designed 2H30 precision horizontal double spindle disk grinder has just been published. Write on a company letterhead to *Gardner Machine Co., Beloit, Wis.*

Compressors

Belt and steam driven single-stage horizontal compressors from 50 to 2000 cfm and from 10 to 150 psi is the subject of a new bulletin including basic specifications, standard equipment, running gear parts, capacity control, cylinder construction, feather valves, and special applications. Write for bulletin L-640-B1C to *Worthington Corp., Advertising & Sales Promotion Dept., Harrison, N. J.*

ASTE Tool Show

A 16-page "Executive Plan Book" giving details of the show, scheduled for Chicago, March 19-23, is available to top management executives. It is designed to aid in assigning key men to cover specific exhibits, technical sessions and plant tours at the event. Write on company letterhead to *American Society of Tool Engineers, 10700 Puritan Ave., Detroit 38, Mich.*

VOID After Apr. 15, 1956 **2/15/56**

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This vast inventory, combined with Continental's top position in the design and production of special fasteners, guarantees you faster service and a top-quality product.

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Only Continental Engineers
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Each engineer at Continental is required to undergo thorough experience producing ground thread taps and gages, with their exacting screw thread dimensions. This special training is passed on to you—at no extra cost.

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Continental Screw Co.

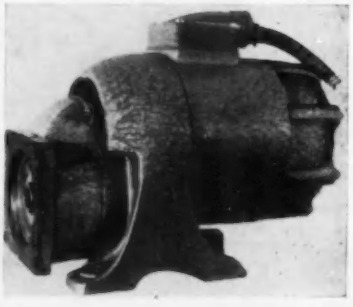
Manufacturers of Holtite Fastenings
New Bedford, Massachusetts, U.S.A.

NEW PRODUCTS AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card on PAGE 89

Pump Motor

A lightweight motor, internally geared, for aircraft hydraulic pump drive and which weighs only 28 lb and delivers 11.5 hp at 2450 rpm, is now



in production. Designation is the type GA hydraulic pump drive motor. It is self-ventilating and designed so that balance is attained with the mounted pump. Designed for intermittent duty, the motor delivers 11.5 hp for 10 sec, and 1.5 hp for 170 sec. It operates on 3-phase, 400 cycle ac, up to altitudes of 25,000 ft and has a starting torque of 45 lb ft. *U. S. Electrical Motors Inc.*

Circle 65 on postcard for more data

Hard-Facing

A nickel-chromium-boron-tungsten hard-facing material for providing parts exposed to extreme conditions of vibration and/or heat with a wear and corrosion-resistant surface is now available. Named Colmonoy No. 70, the new alloy has a high tungsten content which is said to harden the matrix, giving it improved heat and vibration-resistant properties.

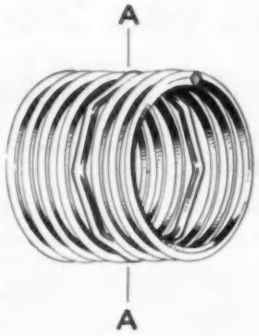
Originally developed to overcome fretting and fretting corrosion at temperatures of 1000 F and more on jet engine shafts, it is also recommended by the maker for use in engine valves, chemical valves, acid pump parts, and for handling scouring type loose abrasives. The material is available as a powder for application by spray-welding or as welding rod in 3/16, ¼, 5/16 and ⅜-in. diam for application with an oxy-acetylene torch flame. It is also available as castings. The material is said to produce a surface whose hardness ranges from 50 to 55 Rc, sp gr is 8.5, melting point is approximately 2000 F. *Wall Colmony Corp.*

Circle 66 on postcard for more data

Locking Insert

Mid-grip Screw-Lock inserts were developed to eliminate lock-washers, lock-nuts and locking wires. They also are said to provide strong, permanent, wear-resistant threads in the light metals, plastics, steel and cast iron. The insert requires no more boss diameter or wall thickness than a conventional tapped thread.

The new insert is a companion product to the original Heli-Coil wire



screw thread insert. Both are made of precision-formed stainless steel. Both provide 60-deg threads. Both are installed with similar tools by the same methods. One or two coils in the middle of the insert are generally octagonal instead of being perfectly round. As the screw passes through this area, the gripping coils are forced to assume a circular shape. The chords of the circle press on the screw, giving the locking effect which is not diminished through many cycles of disassembly. *Heli-Coil Corp.*

Circle 67 on postcard for more data

Indicator Lights

Fully insulated, two-terminal indicator or warning lights in the smallest sizes consistent with the dependability required for aviation and

critical industrial applications have been announced. The lights are available in two basic styles — series L-6600, a subminiature design measuring only 1-15/64 in. long by 15/32 in. diam; and the L-3200, a slightly larger version 1-9/32 in. long by ½ in. diam with a built-in "press-to-test" circuit for critical warning light applications. The lamp circuit is fully insulated from the case in both types. Miniature AN-3140 lamps are mounted deep inside a long plastic lens. Inside bevelling of the lens serves to pipe the light throughout the entire periphery, to assure maximum visibility from all angles. *Hetherington, Inc.*

Circle 68 on postcard for more data

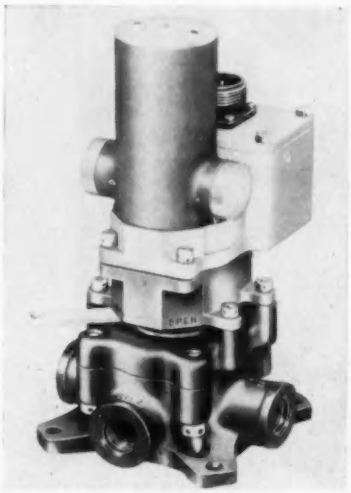
Headlamps

Two new "All-Weather" headlamps are being introduced, featuring the "aim - right gizmoes," — glass pods molded in the lens to enable quick and accurate aiming with any of the more recent mechanical aiming devices. The glass pods hug the surface of the lens where they are not vulnerable to breaking, cracking or chipping, and are completely smooth and flush with the lens at the inner edge. They project only 0.35 in. above the lens surface at the outer edge. The new headlamps are designated as 5400S (12v) and 5040S (6v). *General Electric Co.*

Circle 69 on postcard for more data

Selector Valve

A motor-operated four-way rotary selector valve designed for aircraft high-temperature hydraulic systems is in production. An addition to the



hi-g series catalogued AV-14A, the valve can change position in 0.5 sec at −65F and remains in either position without electrical power consumption. The operation is independent from pressure in the hydraulic system. The brief period during which the electric motor operates to change position adds to the suitability of this valve for high ambient and high fluid temperature applications.

Present units are being manufactured to operate at temperatures from −65F to 275 deg F, and function in the pressure range of 0 to 3000 psi. Both ⅜ in. and ½ in. tube size models are supplied with 24-v dc motors. Optional equipment includes a manual over-ride which is completely independent of the electrical power to the valve or physical position of the valve. Also available are switches for signal lights. *General Controls Co.*

Circle 70 on postcard for more data

Emergency Brake

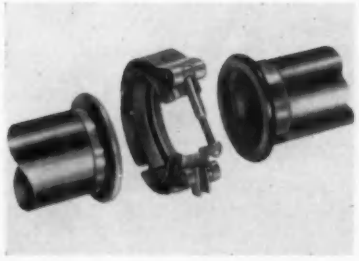
"Packaged Power" ballistic type brake actuators are offered to provide emergency service brake actuation in the event of failure of air-operated brakes on motor trucks. The company feels this equipment provides an answer to the proposed ICC regulations calling for an auxiliary emergency brake system for heavy duty vehicles.

Their operation is based on the principle of utilizing the gas pressure resulting from combustion of a propellent powder. They consist of small, light units installed in the service brake system as part of the push-rod assembly, normally functioning as the brake chamber pushrod. In the event of failure of the air system the propellent charge is ignited by the electrical system of the vehicle, using either a manual switch or a foot-operated switch, drawing two-amp current. As ignition is initiated the pressure of the gases forces the brake actuator piston down the cylinder, acting against the slack adjuster as in the normal manner. Actuators are said to respond in 0.003 to 0.006 second. They are available with different thrust capacities and various lengths of stroke to match the requirements of standard brake chambers. The actuators are said to be safe and shielded against premature initiation from stray electrical currents. After use they can be exchanged for a recharged unit. *Talco Engineering Co., Inc.*

Circle 71 on postcard for more data

Duct Couplings

Light weight couplings, designed for bleed air duct-work in jet aircraft, have been developed. The metal clamps and flanges are said to be as

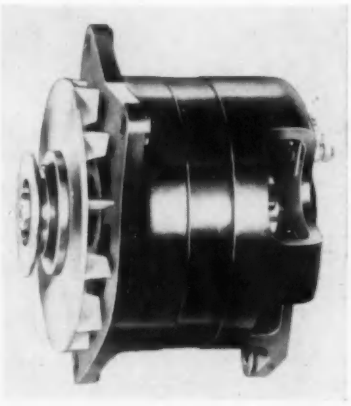


much as 40 pct lighter, permitting weight savings. Weights of the seven different sizes available range from 0.33 lb for a 1½-in. assembly to 0.68 lb for the 4-in. size. Connecting and disconnecting of clamp is facilitated by a latch assembly with no loose parts and low torque on the lock nut. Leakage is said to be held below the design specification of .01 cfm per in. of duct diameter, independent of the number of times disconnected. The seal is achieved by direct metal-to-metal contact only, at the face of the two flanges. No gasket is required. The new couplings are specifically designed for continuous use with pressures of 250 psi at temperatures of 750F. *Janitrol Aircraft-Automotive Div., Surface Combustion Corp.*

Circle 72 on postcard for more data

Alternators

Two new models of heavy duty alternators designed to replace standard dc generators on passenger cars, light and medium trucks, school busses, or other equipment which is



driven regularly at slow speeds with frequent stopping and starting, or which have heavy electrical loads, have been introduced. Model 5410-G3 is designed for rolling equipment with six-volt electrical systems. It has a 95-amp capacity, and is suited for such specific types of vehicles with two-way radio or telephone as police cars, highway patrol, taxicabs and utility trucks. Model 5412-G6 offers the same applications except that it is used on vehicles having 12-v systems. It has a 50-amp capacity (equal to 100 amp at six volts), and can be modified to give up to 125 amp. An important feature is that a transformer may be attached to the alternator to give up to 800 w of 110-v portable power. *Leece-Neville Co.*

Circle 73 on postcard for more data

Wire Insulation

Manufacture of glass-Dacron yarn, an abrasive-resistant insulation which adheres readily to copper, has been announced. Designed primarily for use in magnet wire, the yarn is also used for aircraft electrical cable construction and for sleeving and tubing. It is supplied wound on serving or braider packages. In addition to its claimed long life and abrasion-resistant qualities, it is said to have the advantage of being able to withstand the considerable abuse encountered in processes of manufacturing motors, generators and transformers. *L.O.F. Glass Fibers Co.*

Circle 74 on postcard for more data

News of the AUTOMOTIVE AND AVIATION INDUSTRIES

Continued from Page 39

Damaged Ford Plant Scheduled To Resume Operations Shortly

Production was expected to get back to normal early this month at Ford's Long Beach, Calif., assembly plant. The facility was damaged in January by a flood, explosion, and fire.

Most of the damage occurred outside of the plant in the paint and oil building, although it was estimated that about $3 million worth of automobile parts were damaged when water flooded the plant after several dikes collapsed. A number of automobiles in the process of assembly also were damaged.

Packard-Clipper Forms Unit To Study New Type Car Horns

Automobile horns are getting considerable attention from engineers. Several companies are working on making horns either more audible and less irritating or devising some alternative type of signal for warning other drivers.

Packard-Clipper Div. reports that it has established a special engineering section to study horn sounds and develop new types. Another company is said to be testing a device which automatically flashes the headlights when the horn ring is depressed.

Industrial Applications Seen For Bendix and GE TV Systems

Bendix Aviation Corp. has disclosed that it will undertake commercial production of a new electronic device that is said to amplify light 40,000 to 50,000 times. Called the Lumicon, the device is expected to find widespread applications in processes basic to science and industry.

The Lumicon consists of a detector unit or orthicon image tube linked to a monitor or picture tube through a closed television circuit. The closed system without broadcasting or receiving antenna amplifies light through the use of new electronic concepts. A "light tunnel" containing a fluoroscopic screen is added to the detector for X-ray purposes. Only low-level X-ray energy is required to operate the device.

According to LeRoy D. Kiley, general manager of the Friez Instrument Div. of Bendix, the Lumicon will make possible immediate X-ray inspection of forgings, castings, engines of all types, and comparable large objects. Cost of the Lumicon is estimated at approximately $20,000, depending upon lenses required and use of the instrument.

General Electric Co. has also announced development of a new television X-ray inspection system that can be used for industrial applications. Heart of the GE system is a new type of pickup or lead-oxide-coated X-ray camera tube which is said to permit direct conversion of X-ray into an electrical signal that is displayed on the television receiver screen.

Weight of the new GE system is less than 150 lb, and voltage used to scan the X-ray image in the television camera is only 250 volts. The signal created by the scanning beam can be recorded on magnetic tape and kept for a permanent record, or the image may be photographed from the viewing screen.

ONE - MAN LIFT

This new hydraulic lift, designed by Keystone Engineering Co. for ground handling of air cargo, can handle a maximum payload of 3500 lb. lifting it from a minimum height of 32½ in. to a maximum of 124 in. A four-cylinder engine is governed to a speed of 12 mph in compliance with airport regulations. One-man operation is made possible by means of a remote control lifting and lowering mechanism.

Keller to Yield Chairman Post At Chrysler; To Be Consultant

K. T. Keller, chairman of the board of Chrysler Corp. since 1950, will retire from active management of the corporation when his term expires in April. Mr. Keller's decision to relinquish his post came as no surprise to the automobile industry. At a board meeting early this year, Mr. Keller indicated he had no desire to be renominated.

Mr. Keller served as the corporation's president from 1935 to 1950, when he relinquished his post to L. L. Colbert. Under his contract, Keller will get paid $75,000 a year as a consultant. Mr. Keller, who observed his 70th birthday last November, joined Chrysler Corp. as a vice-president in charge of manufacturing in 1926. Three years later he became president of Dodge Div.

Gar Wood, St. Paul Hydraulic To Combine Their Operations

Gar Wood Industries and St. Paul Hydraulic Hoist have announced they will consolidate their operations. All production of truck equipment made by the two firms will center at Wayne, Mich., and Richmond, Calif.

(*Turn to page* 177, *please*)

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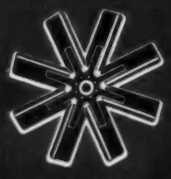
Specialists for over 37 Years in

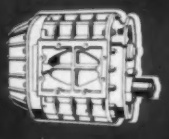
FLUID FLOW and VIBRATION DAMPING PRODUCTS



Fans

Turbochargers

Dampers



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Schwitzer utilizes the most modern production facilities for the Fabrication, Assembly and Testing of these Precision Products—for high or low volume production.

These services are available to you for product development applications in many diversified fields.

Water Pumps

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CORPORATION

INDIANAPOLIS, INDIANA

AIR BRIEFS

By RALPH H. McCLARREN

Canada Increases Rate Of Mineral Discovery

To keep pace with the increasing rate of consumption, new methods are being employed in Canada to discover ore reserves. The development of special airborne electromagnetic detection equipment now makes possible large scale geophysical operations. Such instruments can give indications of metals such as nickel, copper, lead and zinc, normally found in sulphide bodies, to a depth of about 300 ft below the surface.

Douglas N. Kendall, vice-president of Aeromagnetic Surveys Limited, Toronto, Canada predicts Canada's mining geophysical industry will double in the next two years. Present rate is about a $6 million a year activity.

More Production of Supersonic Jet Interceptors

Convair Division of General Dynamics Corp. has been awarded the largest U. S. Air Force contract yet placed for production of Convair's F-102A all-weather interceptors and TF-102A combat proficiency trainers. Neither numbers of aircraft nor dollar amounts were disclosed according to Joseph T. McNarney, president of Convair.

This is the fourth contract for the F-102A series and is for more aircraft than all the first three contracts combined. The F-102A is a delta-winged plane with an electronic control system which can pinpoint hostile aircraft, regardless of weather.

Radar for Private Aircraft

The Garrett Corporation's AiResearch Aviation Service division which has pioneered the field of weather radar installations for private business aircraft, has announced it is now equipped to install RCA, Bendix and Collins radar units, together with a special AiResearch nose modification kit and radome, on any Douglas DC-3 or C-47 or Convair airliner.

The nose modification kit and radome are CAA approved, with no change in the basic DC-3 or C-47 top airspeed limitations, as is required with other radomes.

They have installed weather radar units and kits in Convairs for the Ford Co. and the Texas Co. Two DC-3 installations for Ford and RCA Victor have been completed.

Federal Airways System

The Air Transport Association has recently announced publication of "The Magic Web," the story of the Federal Airways System.

Turned out in pamphlet form the story tells how the "web"—150,000 miles of controlled airways operated by the Civil Aeronautics Administration—has set a record in safety and confidence even though the sky today is full of aircraft of all types.

It points out that the scheduled airlines, even though far outnumbered in their operations in the "web" by military, private and other civil aircraft, still pay for their use of the system.

Earth Satellites

Plans and program for building, launching and observing earth satellites were presented at the 24th annual meeting of the Institute of the Aeronautical Sciences held in New York City on January 25, 1956.

Joseph Kaplan, Chairman, U. S. National Committee for the International Geophysical Year (1957-1958), described the part the U. S. will perform in the overall program and noted in particular the rocket and satellite studies which have been planned. Hundreds of research vehicles will be fired and launched from Arctic to Antarctic sites and world wide observations made of their behavior and data from their instrumentation.

Fred L. Whipple, Director, Smithsonian Astrophysical Observatory spoke of the geophysical and astrophysical information that would be obtained from observing an inert satellite. Assuming a small non-instrumented satellite in an orbit about the earth, from 200 to 800 miles distance, with a revolution of about 90 minutes, measurements could be taken to establish to a high degree of precision the shape of the earth. Also, much increased knowledge will be obtained about the distribution of mass within the earth, density of material near the surface compared to that near the center.

J. A. Van Allen, Head, Department of Physics, State University of Iowa stated that a satellite carrying active instrumentation possesses many advantages over rockets for scientific investigations because of the continuous and long-time nature of measurements and observations. Initial work will concentrate on observation of the ultraviolet and X radiation from the sun; of primary cosmic radia-

(*Turn to page* 145, *please*)

Tied up by tubing problems?

Let Rochester show you the ropes! From design to delivery, Rochester engineers and specialists work with you, assuring top-quality steel tubing and suggesting ways to save you time and money. GM Steel Tubing serves modern industry with top efficiency . . . *and much more economically.* That's why you'll find it on more cars—more refrigerators and freezers—more advanced products every day. GM Steel Tubing is rugged, reliable, flexible, versatile—designed to take it and take any shape. Contact your Rochester Products engineer or write us direct for further information.

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The BUSINESS PULSE

New Federal Budget Puts a Temporary End to Retrenchment. Evidence of Some Leveling-Off in Business Activity Does Not Necessarily Point to a Downturn in the Near Future. Business Should Continue at Present Levels for Some Months.

This Survey Is Prepared Exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Company of New York.

Shift in Administration Policy

Most of the really big news last month was made in the nation's capital, with the presentation to the Congress of the President's message on the state of the Union, the budget and the economic report.

These documents, in combination, have been interpreted by many observers as marking a shift in policy on the part of the Administration away from the strict economic orthodoxy to which it originally adhered, and in the direction of a greater measure of "statism." This is well illustrated by the new budget, which puts an end to retrenchment, at least for the time being. In brief, there seems to be pretty general agreement that the Administration's program spells out a resumption of the growth of "big Government," with all that this implies from the socio-economic standpoint.

Boom Leveling Off

On the business scene, interest continues to be focused on the question of whether or not the business boom is leveling out. By and large, incoming reports indicate that it definitely is.

The automobile situation continues to hold the center of the stage in this regard. The output of cars in January was held well below the December pace, but even so it seems likely that figures on dealer inventories, when they become available, will show a further rise for the month, inasmuch as sales remained comparatively sluggish. Since stocks were already at an all-time high on January 1, this further apparent rise suggests the very real possibility of an additional curtailment of automobile production before long, unless retail deliveries pick up.

The reduced volume of automobile output led to moderate employment layoffs by some makers in January, as well as announcements of some production retrenchment by parts makers. Meanwhile, reports continue to come in of slackened demand for steel and other materials by automobile manufacturers. This pattern of events—that is, of curtailed automobile operations imparting a negative impact to other industries—is just the reverse of 1954-1955 conditions. The hope is that the automobile curtailment will be held sufficiently within bounds to render the present negative impact of less general significance than the previous positive impact.

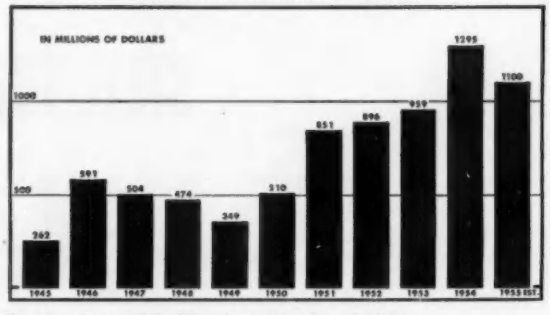
Beyond the automobile situation, there are reminders that some other sectors of the economy are none too buoyant. Private new-housing starts, for example, declined in December for the fourth consecutive month. In that period starts ran at a seasonally adjusted annual rate of 1,187,000 units, the lowest since mid-1954 and below the 1.2-million goal which Administration spokesmen have indicated that they desire to see held. Close on the heels of this experience —and apparently because of it—the Veterans Administration and the Federal Housing Administration announced that the permissible term for Government-guaranteed mortgages was being extended from 25 to 30 years.

Inventories Up

Data on inventories for November, which became available only last month, provided further confirmation that an inventory accumulation of greater-than-

(*Turn to page* 148, *please*)

EXPENDITURES ON NEW PLANT AND EQUIPMENT IN MOTOR VEHICLE MANUFACTURING INDUSTRY



Source—Automobile Manufacturers Association

"Here's where the **TORRINGTON NEEDLE BEARING** *gets its high load capacity"*

The radial load capacity of an anti-friction bearing depends, in the final analysis, on the number of lines or points of contact made by the bearing surfaces in the load zone. This is where the Torrington Needle Bearing really shines.

With its full complement of precision-ground rollers, the Needle Bearing gives many more lines of contact than other types of anti-friction bearings. Thus for a given size, the Needle Bearing has a *greater* radial load capacity than other bearings.

What does this do for your product? The Needle Bearing can give you the benefits of its high-capacity performance for little more than the cost of a plain bearing; it can help you reduce the size and weight of surrounding members without sacrificing shaft strength, thickness or rigidity.

For twenty years, our Engineering Department has helped designers and manufacturers throughout industry to adapt the unique advantages of the Needle Bearing to their products. Let us help you make the Needle Bearing "standard equipment" in yours.

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TORRINGTON NEEDLE BEARINGS
Give you these benefits

- low coefficient of starting and running friction
- full complement of rollers
- unequalled radial load capacity
- low unit cost
- long service life
- compactness and light weight
- runs directly on hardened shafts
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TORRINGTON BEARINGS

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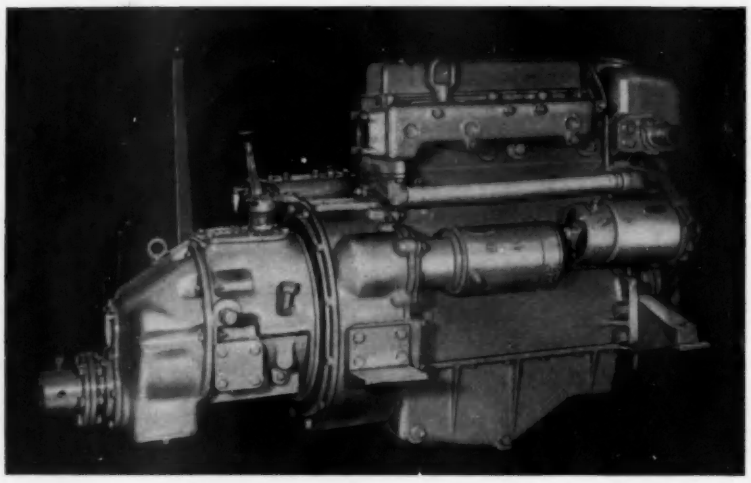
The National Motor Boat Show

Engine Power Continues Upward as Industry Foresees Increase of at Least 10 Per Cent in Total Business During 1956



The new Graymarine Diesel D-129 develops 25 hp at 2000 rpm, for sailing auxiliaries, and small utility workboats

MORE power was the keyword for the 1956 National Motor Boat Show, the 46th such exhibition to be staged in New York City. There were some 300 boats of all types on display, as well as over 100 engines of inboard and outboard types. Several new engines were displayed for the first time, and at least two new manufacturers of marine engines and outboards made their bow at the show.

The American motorboating public is set to spend a record amount this year, according to the plans of the various exhibitors. Prosperity in the industry extends throughout; engine and boat makers report that they are ready to boost production 50 per cent in some instances. Apparently, all expect business to increase 10 per cent and more.

Popularity of inboard power for smaller pleasure boats appears to be increasing, after yielding to outboards recently. New inboard engines included the Chrysler Imperial V-250, a so-called luxury class 250-hp engine with twin carburetors which will be in limited production this year. The 331-cu in. engine is offered with 8.2 or 7.2 to 1 compression ratio. Largest engine on the floor was the Hercules eight-cylinder Diesel of 500 hp.

Dearborn Marine Engines, Inc., presented its latest engine, a 215-hp "Y" block V-8 which is said to weigh just under three lb per horsepower. The 9 to 1 compression ratio engine has a top operating speed of 4900 rpm. Its twin horizontal type carburetors obtain air from the valve chamber and are completely contained within the height of the manifold. Engine mounts are adjustable for precision alignment. A reduction gear is offered with a 10-deg angle drive to allow leveling of the engine.

Detroit Diesel Engine Div. of GMC announced a six-cylinder vertical model 71 in aluminum, which develops up to 235 shp at 2300 rpm. It weighs 2270 lb with reduction gear. Other engines on display also featured extensive use of aluminum alloys. Four-cylinder and twin-six vertical aluminum models now are included in the line.

Celebrating its fiftieth anniversary year, Gray Marine Motor Co. presented three new engines among the many models on display. New models include a 120-hp single carburetor companion to the dual-carburetor "135," and a four-cylinder 162-cu in. 70-hp gasoline engine primarily for kit boat builders. For small work boats Gray introduced a four-cylinder 25-hp Diesel which weighs only 656 lb with reduction gear. All models feature built-in fresh water cooling systems and extensive use of aluminum. Minor improvements were made throughout the line, which includes models up to 427 cu in.

Nordberg Manufacturing Co. has redesigned its complete line of seven gasoline engines to be smaller in most dimensions and to include seven bearing crankshafts, waterproofed spark plugs, gear driven generators, double pass manifolds, oil coolers and filters, and extra heavy flywheels.

Palmer Engine Co., only exhibitor at every one of the 46 national shows, revealed that it will produce three additional engines based on the International Harvester block. First is a redesign of its model PH-45, lighter and four in. shorter because of a new

(*Turn to page* 120, *please*)

Simplify PRESS LINE LAYOUT,

BOOST PROFITS WITH THE CLEARING P-50

The Clearing P-50—a brand new idea in metalworking presses—may be able to solve some problems in your shop. First of all, the P-50 is designed for complete versatility. It can do practically any job in its capacity range. Its adjustable table will provide the right die space for both high and low dies. Remove the table completely for horn press operations.

Put it anywhere in your press line to perform follow-up operations or tool it up for a long run blanking or forming job. The P-50 is built to give top production in either spot.

The P-50 is designed for simple portability and installation. Its enclosed design means that if it will fit into a spot it can be operated there. Gearing and flywheel are built into the frame; so are controls and die space lighting. Simply connect your air line and power; the P-50 is ready to go. If your production setup can use a utility press the P-50 will pay for itself in convenience and time saved. Find out more about it. Write or call Clearing for more information.

This completely self-contained P-50 features fully enclosed design and built-in controls. This speedy machine (single strokes at 80% of rated strokes per minute) can be moved anywhere in the shop and put into operation in a matter of minutes.

Write for Clearing brochure, "Thinking about a better way to do the job?"

CLEARING PRESSES

THE WAY TO EFFICIENT MASS PRODUCTION

CLEARING MACHINE CORPORATION *Division of U. S. INDUSTRIES, Inc.*

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Use of Power Steering CONTINUES to INCREASE

Power Steering Analysis

Make Car	Power Steering Make	Power Steering Type	Percentage Installed 1955	Percentage Installed 1956*
Buick 70	Saginaw	Integral	100.0	100.0
50	Saginaw	Integral	100.0	100.0
60	Saginaw	Integral	55.2	65.7
40	Saginaw	Integral	20.2	26.6
Cadillac	Saginaw	Integral	100.0	100.0
Chevrolet	Saginaw	Linkage	.....	10.5
Chrysler Imperial and Crown Imperial	Chrysler	Coaxial	100.0	100.0
New Yorker	Chrysler	Coaxial	98.9	.....
Windsor	Chrysler	Coaxial	84.6	.....
Continental	Saginaw	Integral	100.0	100.0
De Soto Firedome	Chrysler	Coaxial	51.4	69.1
Fireflite	Chrysler	Coaxial	85.4	96.2
Dodge	Chrysler	Coaxial	20.4	25.4
Ford	Bendix (with Eaton pump)	Linkage	8.0	.....
Hudson Hornet 6	Monroe	Linkage	(see note)	25.0
Hornet V-8	Monroe	Linkage		65.0
Rambler	Monroe	Linkage		5.0
Wasp	Monroe	Linkage		1.0
Lincoln	Saginaw	Integral	100.0	100.0
Mercury	Bendix	Linkage	23.0	30.0
Nash Statesman	Bendix	Linkage	(see note)	1.5
Rambler	Monroe	Linkage		5.0
Ambassador 6	Monroe	Linkage		9.0
Ambassador V-8	Monroe	Linkage		86.0
Oldsmobile 98	Saginaw	Integral	97.0	100.0
Super 88	Saginaw	Integral	69.0	69.0
88	Saginaw	Integral	24.0	24.0
Packard	Monroe	Linkage	52.0	58.0
Plymouth	Chrysler	Coaxial	4.5	7.0
Pontiac	Saginaw	Integral	22.5	31.8
Studebaker	Saginaw	Integral	7.0	10.0

* Estimated for 1956, based on January production, except where standard equipment (100 per cent)

In 1955, 3.24 per cent of Nash, Hudson, and Rambler had power steering

POWER steering has made great strides in public acceptance in the relatively few years this safety-important mechanism has been available. While it would be difficult to estimate the actual number of installations in 1955 production, we have provided an approach by indicating the percentage of production with power steering of each make. This figure, supplied by the manufacturer in each instance, is quite accurate for 1955. In addition, most manufacturers were able to provide us with some estimate of use in 1956 based upon early model run experience.

The tabulation shown here covers all makes of cars produced this year. It is noteworthy that power steering is standard equipment on the following cars: Lincoln, Continental, Chrysler Imperial and Crown Imperial, Cadillac, Buick Series 70 and 50, and Oldsmobile 98.

At the present writing, practice still is divided as between integral and linkage type installations, as noted in the tabulation. All Chrysler divisions now are employing the Chrysler Coaxial integral type gear; while all GM divisions, except Chevrolet, are using the Saginaw integral type gear.

Ford, Mercury, and Nash Statesman models use the Bendix linkage type gear. All Nash and Hudson models, except the Statesman, use the Monroe linkage type gear. Packard is using the Monroe linkage type gear, whereas the Studebaker line has retained the Saginaw integral type gear.

● ● ●

International Harvester Offers New Transmission in 16 Models

A new automatic transmission is now available in 16 International truck models from 4200 to 12,500 lb GVW. These models are included in eight light and medium-duty International series — the S-100, S-110, S-120, S-130, and S-150; and SM-120, SM-130, and SM-150 with Metro Bodies. These can be secured with pick-up, panel, stake, Travelall, service utility, van, and multi-stop delivery bodies.

The new automatic transmission has shift points controlled by a vacuum modulator, which eliminates control linkage and adjustment between accelerator and transmission. Smoother shifting at all speeds is said to result.

All three forward speeds of the planetary transmission are hydraulically controlled and fully automatic. The reverse gear is shifted manually on the selector. Ratios are 1 to 1 in high, 1.467 to 1 in second, 2.47 to 1 in low, and 2 to 1 in reverse.

Combined with the transmission is a new torque converter which multiplies engine torque as much as 2.16 to 1. This reportedly affords the advantages of a fluid coupling and also multiplies tractive effort in starting loads with a minimum of slippage.

The low-speed gear is an inhibited downshift, which permits the driver to place the selector-lever in "low" position while traveling at a relatively high rate of speed without having the transmission immediately shift into low. Possibility of overspeeding the engine is thus said to be greatly reduced. Engine braking and positive parking-brake action, are among other features of the new transmission.

Less Shifting, Less Maintenance with this

CLARK PACKAGE UNIT

Torque Converter and Transmission Integral

Operating advantages are clear and exceedingly profitable, when you use a Clark Package unit

- **vastly reduced shifting—less fatigue**
- **smooth flow of power regulated to engine's most efficient speed —3-to-1 multiplication factor builds up torque to meet need**
- **reduced shocks: longer life for all gears, shafts and engine**
- **greatly reduced maintenance on entire power-train**

A Clark to meet your need—Clark's broad line (15 to 600 hp—11" to 26" diameters) assures a size and capacity for every power-transmission requirement.

You can do as several leading manufacturers are doing: Take advantage of Clark's unique experience in the basic field of torque transmission—from flywheel to point of use—to get more useful power at less cost. Any problems?—talk to Clark.

Start by sending for the Clark Torque Converter Bulletin—a helpful statement on torque multiplication.

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Jackson 2, Michigan

Please send set of Clark Torque Converter Bulletins.

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Adjustable Fifth Wheel

Shifts Weight on Tractor Wheels

CONDENSED SPECIFICATIONS OF BELL ADJUSTABLE FIFTH WHEEL

Platform 38 in. by 72 in. bolted to side rail of frame.

Hydraulic cylinder 5 in. diameter by 15 in. stroke. Four step joint piston rings.

Two-way piston type valve locked in neutral position automatically.

Eight to 11 gal oil. Vane type pump mounted on engine driven by fan or generator belt 1500 psi.

Controlled from cab. (Push button through solenoid switch)

Also available in 20 in., 25 in. and 30 in. stroke.

THE Bell adjustable fifth wheel is a device to vary the amount of weight placed on the rear wheels of a tractor by the trailer. This makes it possible for a driver to reduce the amount carried by the rear wheels when entering a state which has a weight limit slightly under the normal loading of the tractor's rear wheels.

Operation of the mechanism is as follows. A piston, controlled from the driver's cab, moves the fifth wheel forward when it is necessary to shift trailer weight farther ahead of the rear wheels of the tractor. Hydraulic pressure for this piston is furnished by a pump which can be driven by either the fan belt or generator belt. The action of the machinism is positive and provides for locking the fifth wheel in the desired position.

Four models of the adjuster have been designed, the standard model shifting the fifth wheel a distance of 15 in. A larger model shifts to 20 in., and the other two models, designed for tractors with tandem axles, travel 25 and 30 in. respectively.

The Bell adjustable fifth wheel is sold by Transportation Engineering Co., Sheboygan, Wis. and is now in use on a number of tractors.

● ● ●

Austin Sees Economy of Diesel Possible for Its Gas Turbine

Austin Motor Co. has disclosed that development of its secret gas turbine engine has reached a new phase. The target of this phase is the evolution of a unit capable of achieving operating economy approaching that of Diesel engines.

The company notes, however, that among problems still to be solved is the production of a cheap heat exchanger of light construction. When this has been accomplished and additional improvements have been achieved in compressor and turbine efficiencies, Austin foresees fuel economy comparable to that of Diesel engines.

The Austin gas turbine is designed to run on Diesel fuel. Air is taken through an induction silencer and highly compressed in a two-stage centrifugal compressor before being heated up still further in the heat exchanger. Next, it flows into the burner where fuel is injected. The combustion gases are then used to rotate a turbine which drives the compressor, and finally to energize the power turbine, which in turn drives the car.

Exhaust gases are conducted through the heat exchanger before being discharged into the atmosphere. The unit has a maximum engine speed of 23,000 rpm although a smaller engine under development is designed to run at 56,000 rpm.

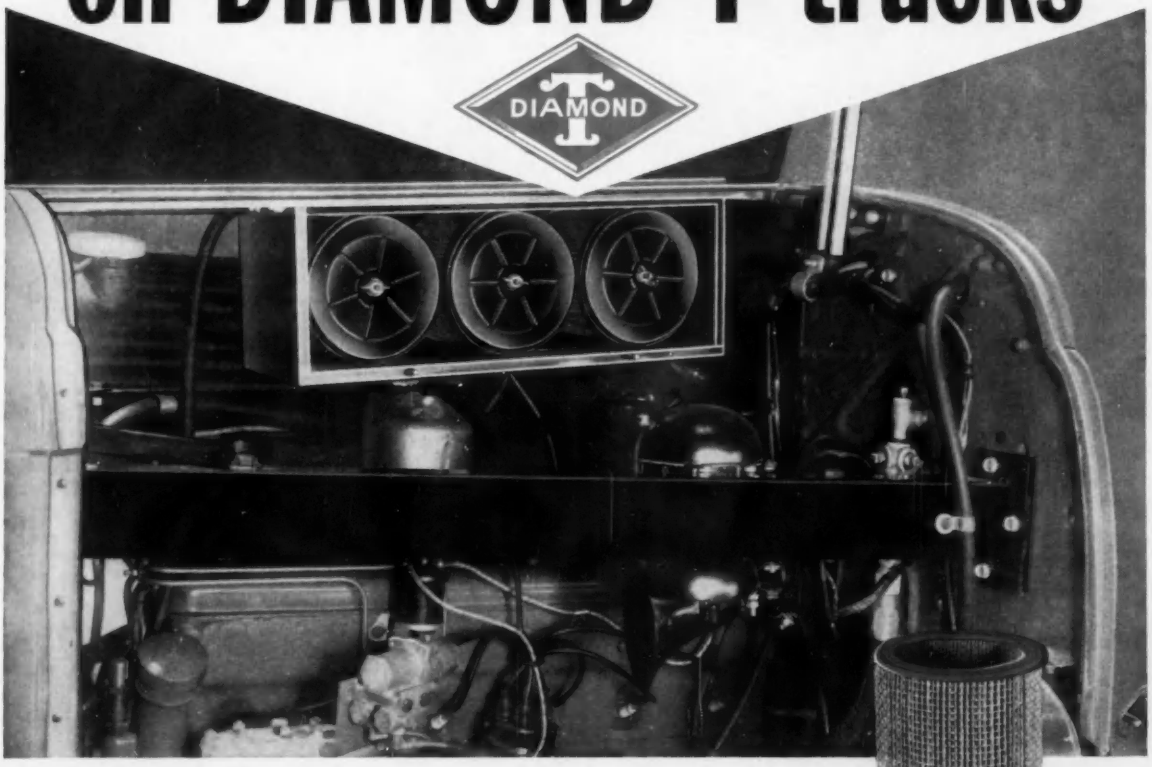
Austin experiments with a small gas turbine engine began in 1949, and by April, 1952, a complete engine had been tested. In August, 1954, a complete power unit was mounted in an Austin Sheerline car and demonstrated privately (see AI, Sept. 15, 1954, p. 36).

The Austin gas turbine automobile, renamed the TUR 1 (a modified Sheerline), made its first and only public appearance in July, 1955. Fitted with a 125-hp turbine mounted in the normal engine position, it was taken on another demonstration run.

Half Million Vehicles Registered in Mexico

Approximately 500,000 motor vehicles are operating in Mexico today, according to the Dept. of Economy's Bureau of Statistics. The actual total is 495,496 automobiles, trucks, and motorcycles, of which 137,092 are registered in Mexico City and environs.

FRAM Air Filters
now standard equipment on DIAMOND T trucks

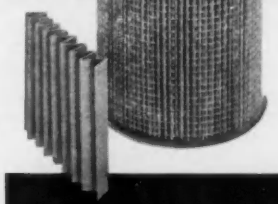


3 FRAM Super Kleen Carburetor Air Filters— 99.5% efficient—cut engine wear, guard power

Now famous Diamond T truck engines enjoy the protection of FRAM Carburetor Air Filters, to preserve power, reduce wear and lengthen life. FRAM will safeguard these Diamond T engines even under the most severe dust conditions.

The FRAM Carburetor Air Filter is the most advanced method of air filtration. It retains high filtering efficiency throughout long life and its low-cost replacement cartridge can be serviced in less than a minute!

FRAM Super Kleen Carburetor Air Filters on your vehicles will cut down-time, add extra miles and pay off in profit. So for your own satisfaction, and your customers' satisfaction, specify FRAM!



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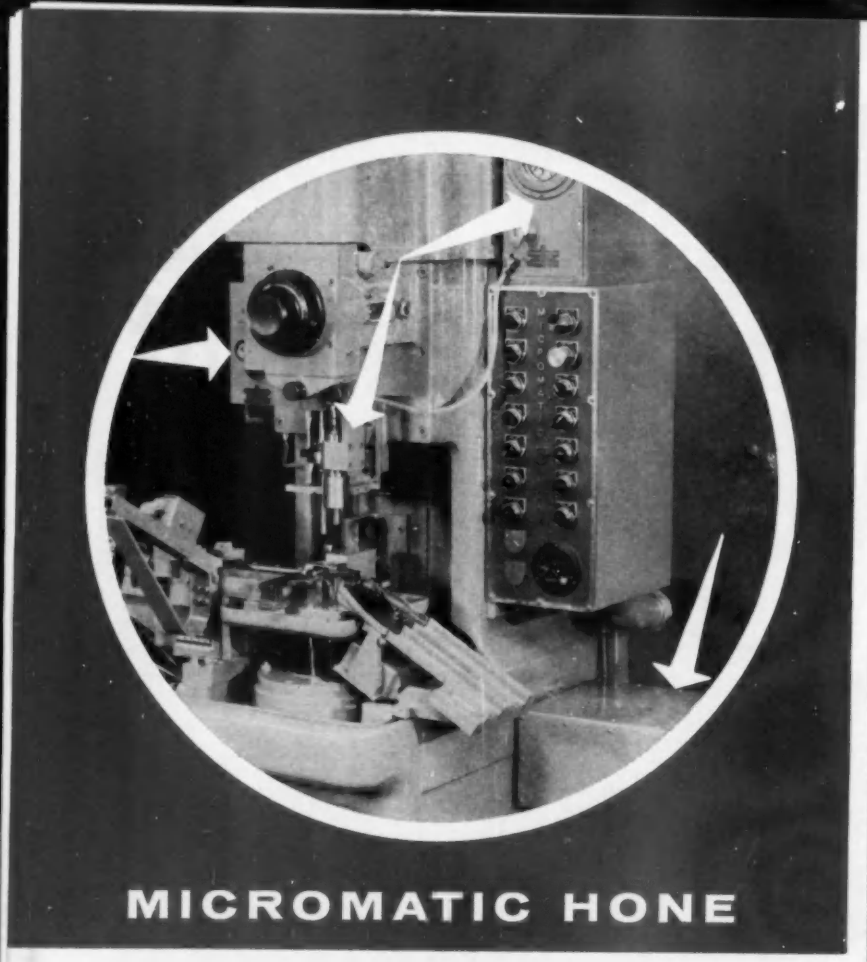

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TIME OUT FOR ADJUSTING

thanks to PRATT & WHITNEY

Automation Gaging

Producing precision parts — dependably held to close tolerances — on this Micromatic "Microhoner" is merely a matter of starting the machine and keeping the feed magazine filled. There are no time-outs for adjusting . . . to gage parts, to find that they're out of tolerance, and to re-set the machine. Production is continuous, output is increased, reject losses are way down.

This is the result of teaming a fine machine with Pratt & Whitney Automation Gaging. It's positive proof that "automation" is a right-now, profit-building reality . . . NOT a something-for-tomorrow dream. It's proof that the best way for *you* to get automation working in your plant is by writing TODAY to Pratt & Whitney's Automation Gaging Engineers outlining your needs.

PRATT & WHITNEY COMPANY
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18 Charter Oak Boulevard, West Hartford 1, Connecticut
Direct Factory Representatives in Principal Cities

MACHINE TOOLS GAGES CUTTING TOOLS

Production of Chevrolet Chassis Frames

(*Continued from page* 59)

in precise locations through the use of special fixtures.

Now that the frame has been completely welded it is transported directly to another quality control operation — piercing of all bracket holes in one setting. With brackets properly positioned, the piercing of all holes in a single master jig assures better alignment of the body at final assembly. Piercing is done in a special Danly machine fitted with hydraulically actuated piercing guns, Fig. 10. Frames are fed into the fixture — which is part of the piercing die — by a walking beam mechanism, are removed from the fixture by means of another transfer mechanism, and delivered to a cross conveyor line leading outward to wash and paint.

The frame is carried flat on this conveyor until it reaches the end of the line where it is carried upward on an inclined conveyor section. Near the top of this elevator the frame automatically engages a hook on a monorail and from this point on is transported in a vertical position to facilitate movement through the chemical washer on the ground floor, a dryer, then through the Flo-Coat booth, drain, and baking oven on the roof. The frame returns on the same monorail to the ground floor where it is prepared for shipment.

Arrangements for shipping differ considerably from conventional methods. A crane operator controls a special lift mechanism that tiers the frames in stacks of 10, individual frames being provided with special shipping locators to lock them in position. Then the crane operator places another stack of 10 on a smaller stack and transports the stack of 20 frames into a special freight car. This method is claimed to be more efficient for loading and unloading, permits the loading of more frames per car, and reduces the hazard of intransit damage.

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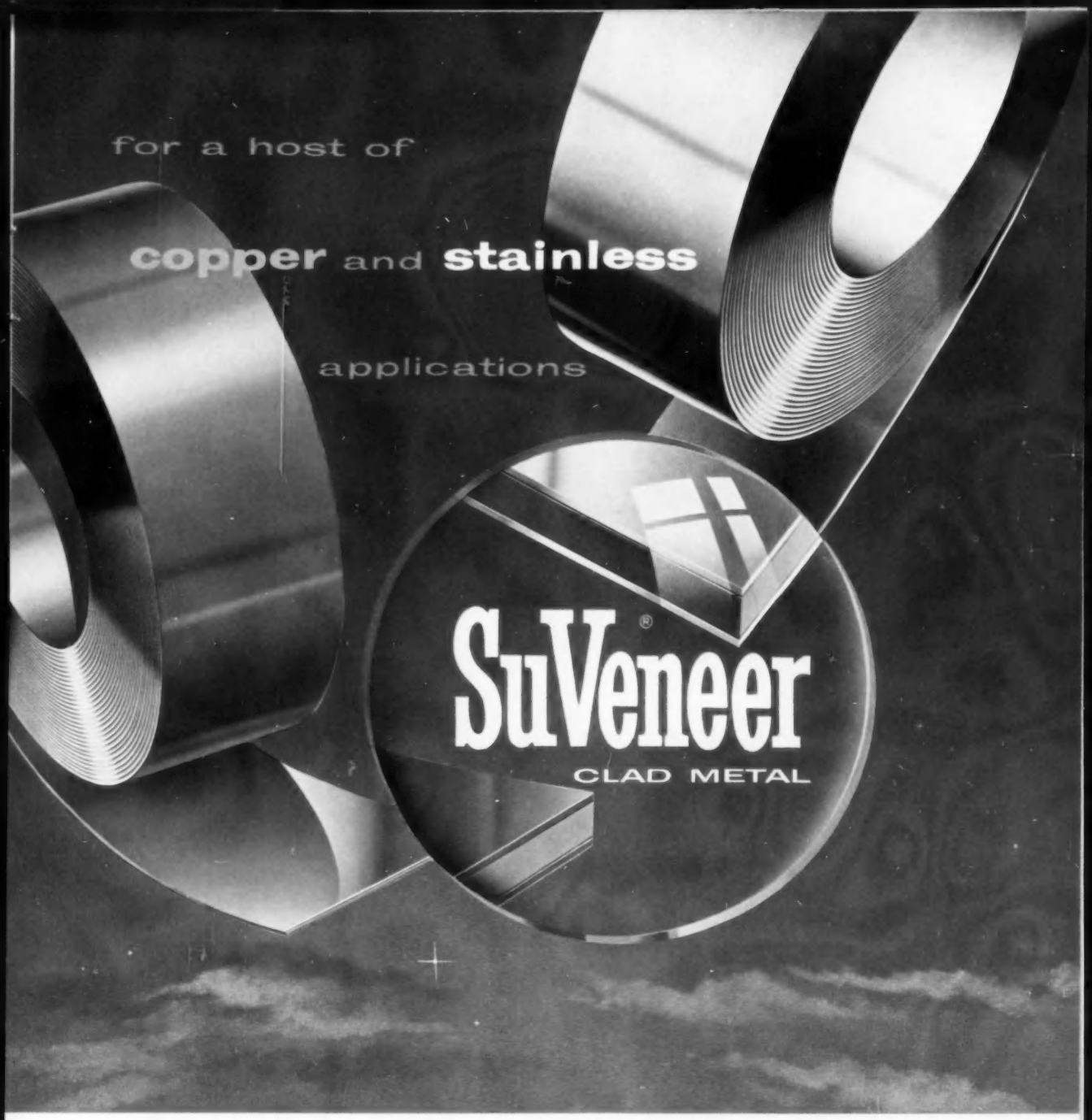

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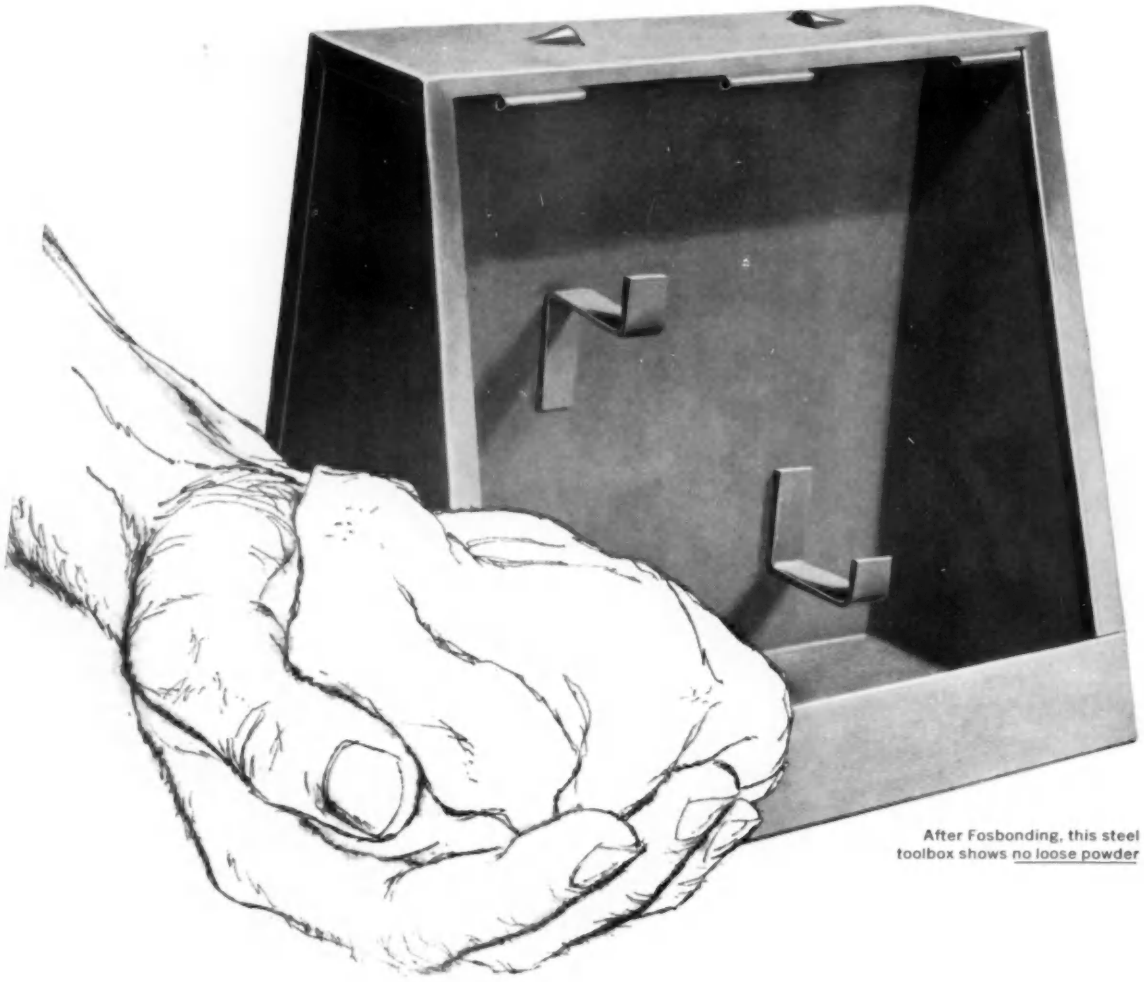

After Fosbonding, this steel toolbox shows no loose powder

Get powder-free iron phosphate coatings under organic finishes with FOSBOND 22

Here's a truly dependable iron phosphate coating! Fosbond® 22 assures uniform, trouble-free phosphate protection of metal parts, cuts your finishing rejects to the bone. The balanced composition of Fosbond 22 prevents the highs and lows of ordinary phosphate films, and its superior cleaning power lets you clean and coat in one spray bath.

Shipped as a dry powder in a non-returnable drum, Fosbond 22 simplifies your storage and processing all down the line. In addition, long, economical bath life and improved corrosion-resistance under organic finishes help Fosbond 22 pay for itself in re-charge savings and lowered reject rate.

TRY IT IN YOUR CYCLE. See how this inexpensive, easily-controlled phosphate system cuts cleaning and coating costs. Where iron phosphate coating is indicated, you just can't match the simple Fosbond 22 process. Ask your Pennsalt representative for a demonstration in your equipment, or write Metal Processing Dept. 260, Pennsylvania Salt Manufacturing Company, Three Penn Center Plaza, Philadelphia 2, Pa. In Canada: Pennsalt Chemicals of Canada, Hamilton, Ontario.

Pennsalt Chemicals

Metal Cleaners • Phosphate Coatings • Cold-Working Lubricants

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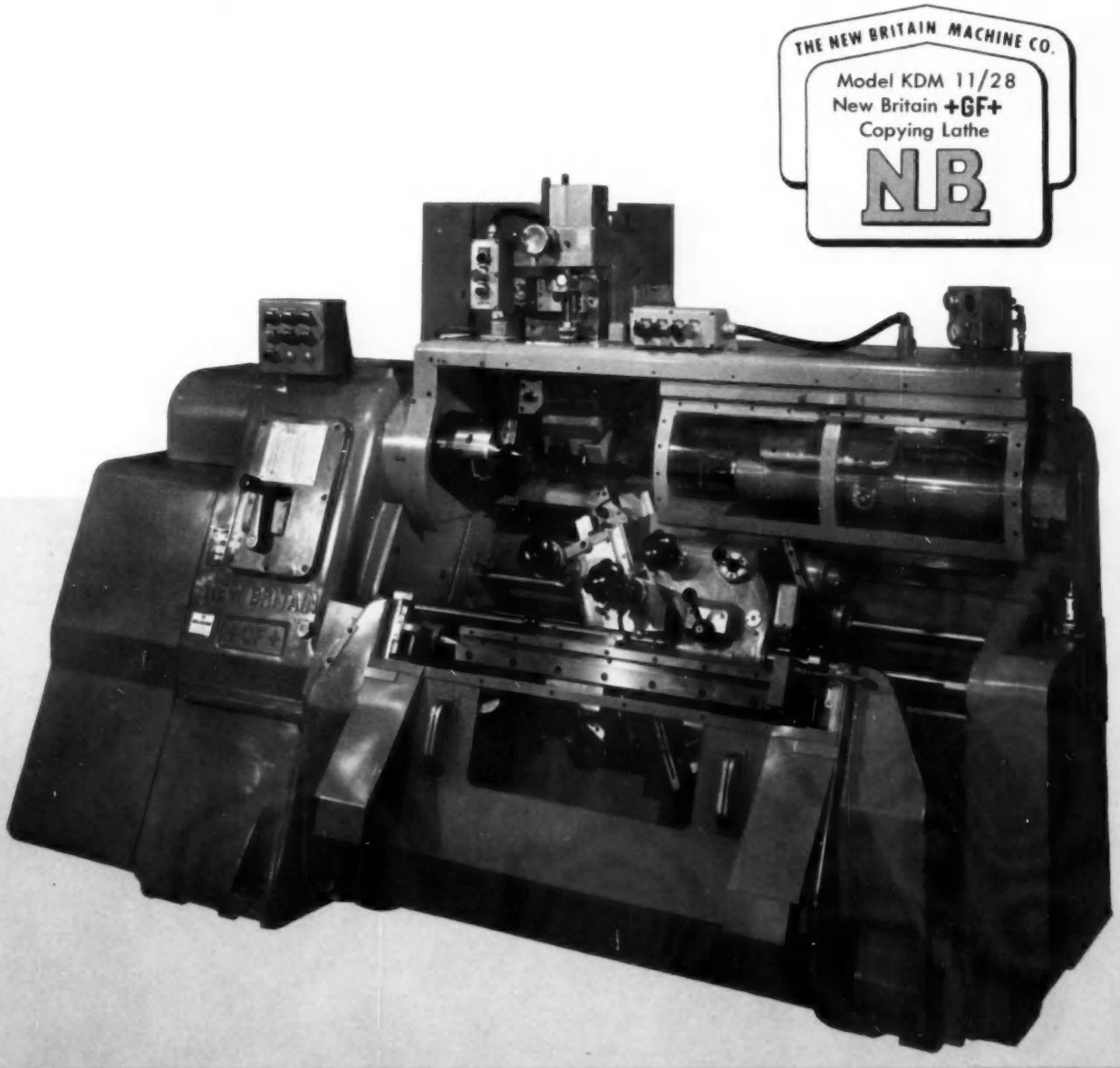
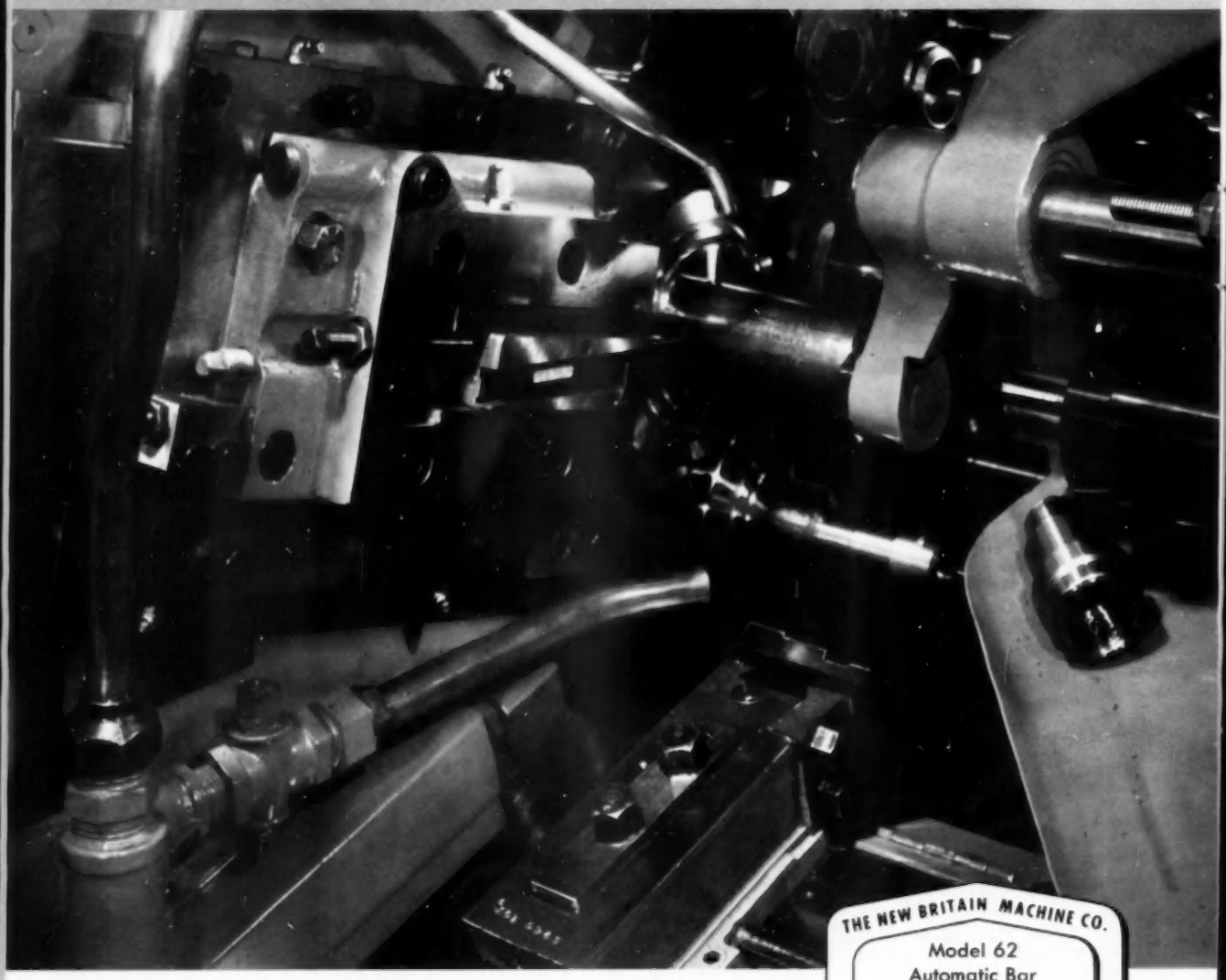
You'll find New Britain **+GF+** Copy Lathes are turning out pieces at profit. With a 15-minute setup on a standard model to make just a few pieces, or with an automatically loaded production model to run a million a year, the New Britain **+GF+** approach can make money for you. For a complete color motion picture demonstration in your office, consult your New Britain representative or write The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.





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Model 62
Automatic Bar
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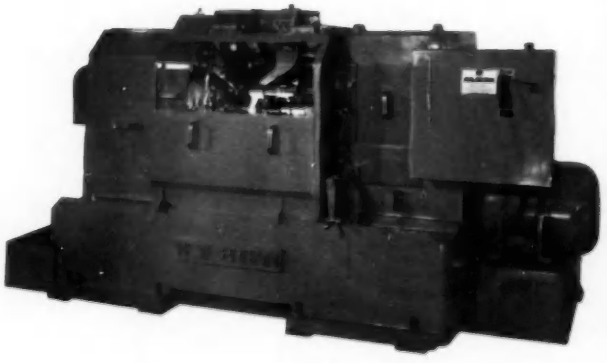
NB

a rugged cross slide in every position

New Britain Models 60 and 61 Automatic Bar Machines are everywhere you turn. The new Model 62 represents new progress in rugged construction and versatility of setup. Your New Britain Representative can show you how to modernize at a profit. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.



Brussels Automobile Show

(*Continued from page 72*)

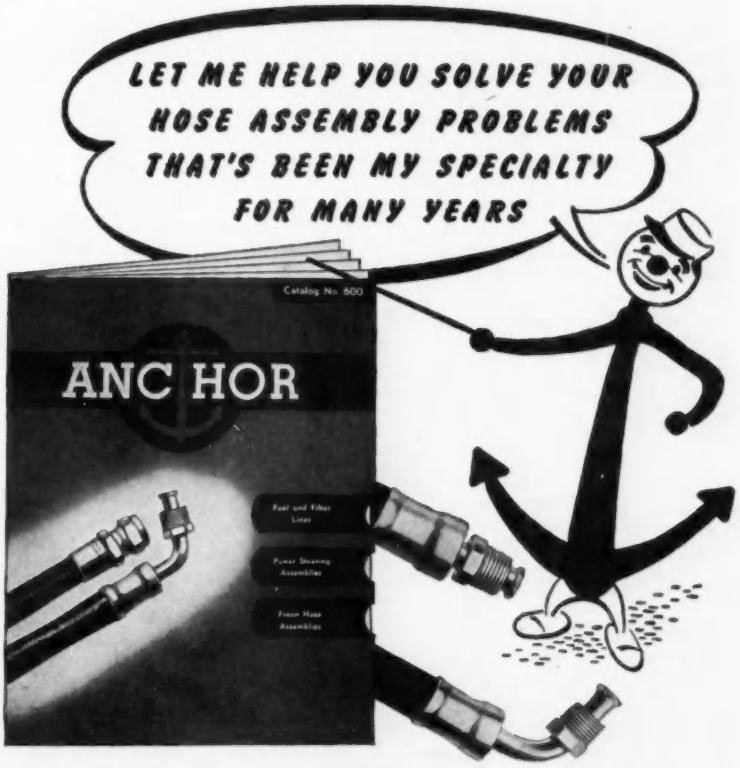
design has been applied by Tatra for several years on passenger cars, but this appears to be its first application to a heavy load carrier.

Russian participation was limited to the Moskvitsch, a model having a very limited sale in Belgium, but East Germany was more strongly represented by the IFA group. As early as 1949 this group produced a three-cylinder, two-stroke engine from drawings of the DKW seized at the Auto Union factory. This year the East German group produced two models to its own designs: the P-70 Zwickau and the Wartburg 311. The P-70 Zwickau is a small, popular car with either a twin cylinder engine of 42 cu in. or a three cylinder of 55 in., the former rated at 22 hp and the latter 38 hp. A new pontoon-type body is entirely of plastic. It has a three-speed, non-synchronized transmission, and weight is 1750 lb.

The Wartburg 311, built at the Eisenach works, is a development of the IFA F-9 and is a roomy and more elaborately equipped four-door sedan, with gear shift lever under the steering wheel. It has a 38 hp., three-cylinder engine.

As presented at Brussels, the new Citroen DS 19 had undergone a few changes on the model first uncovered at Paris. The use of a jack had been made unnecessary by making use of the hydraulic system for raising the car, together with a central strut which held it in its highest position, with both front and rear wheels off the ground. This system of jacking had been used on the earlier six-cylinder model with hydro-pneumatic suspension. To facilitate passing over deep gulleys, the car could be locked in its maximum high position, this raised position being temporary to assure maximum ground clearance.

The Zahnradfabrik of Friedrichshafen displayed a compact marine reduction and reverse gear transmitting 1000 hp. This unit featured two electro-magnetic clutches within the light-alloy housing, mounted on the input shaft and transmitting the drive in either direction according to the one fed by the 24-volt current. A safety device made it impossible to engage the two clutches simultaneously and in case of current failure the full power could be transmitted through mechanical dog clutches.



I am not very good at high sounding claims of "best," "first," "revolutionary," etc. I like to leave them to the users of Anchor Hose Assemblies, Couplings and Fittings. Meanwhile, I devote my experience to insuring PERFORMANCE. I want you convinced that "Anchor" on your hose assemblies means the right hose and coupling style for your particular application. I would like to consult with you to insure this.

Write for literature and send me your specifications for recommendation.

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Anchor Hose Assemblies are designed and built to your specifications.

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Well known Anchor exclusive "Max-Flo" Assemblies are standardly available with rayon braid hose for pressures to 350 PSI or wire braid hose for working pressures to 500 PSI. Operating temperatures from −20° F. to +250° F. Also special tube-type assemblies. Ask for Bulletin No. 600.

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Wide range of styles and sizes for high, medium and low pressures, equipped with pressed-on or reusable couplings. Bulletins No's. 100, 300 and 55-SF.

Adapters, Adapter Unions and Pipe Fittings

For Automotive
Complete line of Anchor Automotive Fittings are described in Bulletin No. 600.

ANCHOR COUPLING CO. INC.
321 North Fourth Street Libertyville, Illinois
Branch Offices: Dallas, Tex.; Plymouth, Mich.

Canadian Aircraft Industry

(*Continued from page* 65)

The Orenda plant was designed for flexibility. There are few special purpose machines in the 750,000 sq ft factory. Orenda Engines has a basic policy of using standard machine tools and putting the skills into jigs, tools and fixtures. Layout and equipment are planned to permit rapid change from one engine model to another, or the manufacture of two or more models concurrently. The plant is kept at a constant 73F winter and summer, since constancy of atmospheric conditions are necessary for the fine tolerances demanded in jet engine production.

General manager W. R. McLachlan of Orenda Engines recently stated that not only has weight been decreased in the various Orenda engines through research, but also costs have been reduced significantly. It is generally considered that $10 per pound of thrust is reasonable for the Orenda type of jet engine. McLachlan points out that costs have been brought down to less than $8 per pound of thrust.

Both Avro Aircraft and Orenda Engines have research departments and top secret guided missile research divisions. Some work is also understood to be underway on uses of atomic energy.

Not far from the Avro Aircraft and Orenda Engines plants is the factory of De Havilland Aircraft of Canada Limited, Canada's oldest aircraft company, having been founded in 1928. The factory had a four-month strike last year, which ended in mid-November. De Havilland produces primarily single-engined aircraft of its own Canadian design. These include the Chipmunk, a militray two-place trainer, the Beaver which is a six-place transport designed for operations from small airfields or small lakes, and a larger Otter 14-place transport for use on small airfields and lakes. The Chipmunk is now in production for the Royal Canadian Air Force, has been produced for air forces of a number of countries, and has also been licensed for production in Great Britain.

The Beaver is in use in 30 countries for military as well as civilian transport. Almost 800 of these aircraft have been built, with some 500 in use by the United States Air Force, under the name of L-20. The USAF uses the plane for reconnaissance, ambulance and other transport purposes, used it in the Korean operations. Airlines in Canada, Norway and the Philippines use the plane as standard transport, while South American countries have dozens of the planes in use. The plant is producing the Beaver for Canadian and other military air forces. The Otter is also being produced for the USAF, U. S. Navy, and other air forces.

In addition to these aircraft De Havilland has an order of 100 Grumman S2F sub-hunter planes for the Royal Canadian Navy. It is also on guided missile work, does overhaul work on General Electric jet engines, and services British-made De Havilland transport planes such as the Dove and Heron for which it has sales rights for Canada.

At Montreal the main aircraft plant is that of Canadair Limited, a subsidiary of General Dynamics Corp. of New York. This factory is busy with production of the Sabre F-86 fighter for the Royal Canadian Air Force, Royal Air Force, USAF and

for today's "power-loaded" engines...
BORG AND BECK
CLUTCHES
MAXIMUM PERFORMANCE
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Through advanced design and creative engineering, BORG & BECK has stepped up the capacity of its passenger car clutches without increasing their over-all dimensions. Compact, light in weight, precision built—for maximum performance, minimum maintenance.
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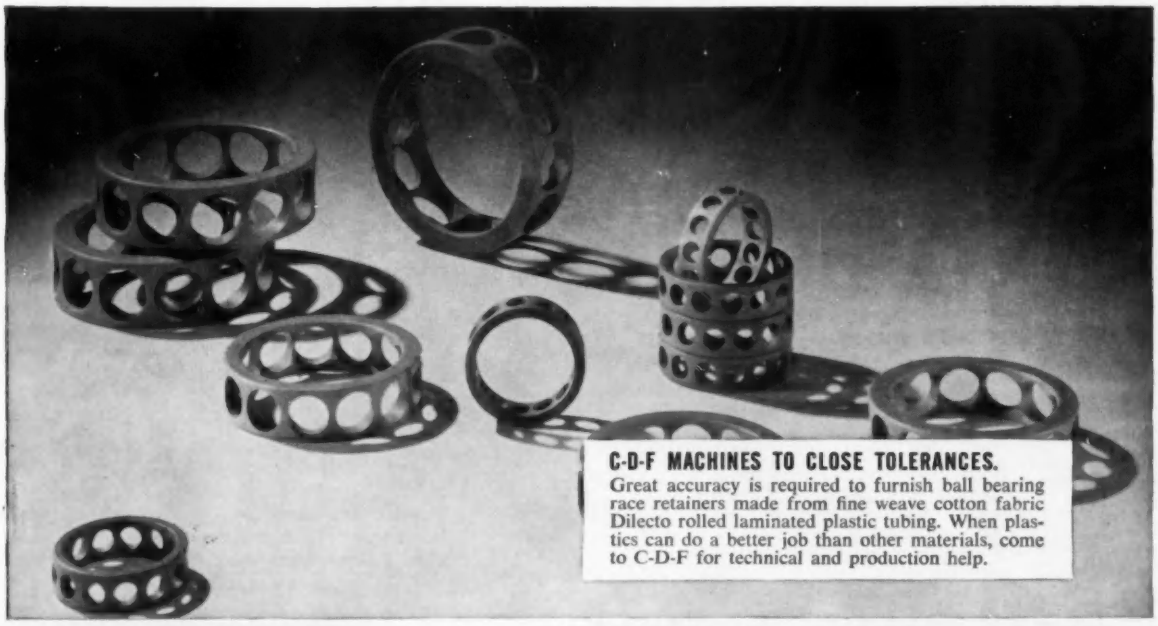
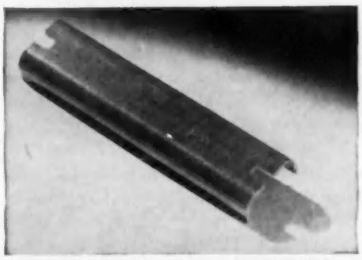
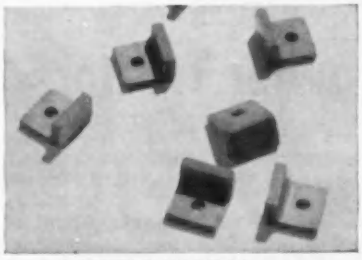


C-D-F MACHINES TO CLOSE TOLERANCES. Great accuracy is required to furnish ball bearing race retainers made from fine weave cotton fabric Dilecto rolled laminated plastic tubing. When plastics can do a better job than other materials, come to C-D-F for technical and production help.



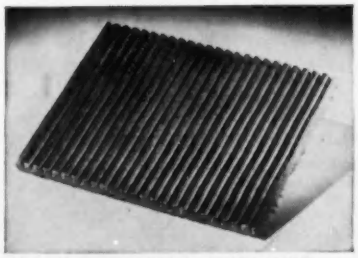
C-D-F PIONEERED IN POST-FORMING of laminated plastics. This technique gives you stronger, more versatile insulating parts with lower costs. This aircraft channel strip is an example of simple post-forming.



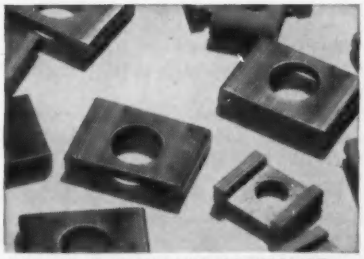
C-D-F DOES THE UNUSUAL. These rubbing blocks are made from fine-weave cotton cloth Dilecto molded *tubing* that has been pierced and cut. The part gains in mechanical strength — the product gets longer service life.

C-D-F SPECIALIZES IN AUTOMATIC SCREW MACHINING of plastic components. These breaker arm bushings are made from Dilecto paper base rolled tubing on high speed machines by men who know and use cost saving methods.

Yes, C-D-F is a big reliable source for fabricated plastics!



C-D-F SERVES MANY INDUSTRIES with fabricated specialties. A great amount is concentrated in the automotive and allied fields. This aircraft part has a corrugated surface on a strong woven asbestos laminated base.



C-D-F IS A PUNCHING SPECIALIST on these starter solenoid insulators. This is XX-26 Dilecto molded channel strip, pierced and punched to length. Special C-D-F punching grades give you lower costs, faster assembly, fewer rejects.

C-D-F COMES UP WITH THE ANSWERS to insulating problems. These unique snap-in grommets are easy to insert, spring out and hold tight. Write for samples. The chances are that C-D-F is already making the answer to your problem.

See our general catalog in Sweet's Design File for more technical data, the address and telephone number of your nearest C-D-F sales engineer. Also, write for detailed information, samples, or send us your print for quotation.

CONTINENTAL DIAMOND FIBRE

CONTINENTAL-DIAMOND FIBRE DIVISION OF THE BUDD COMPANY, INC.

NEWARK 2, DELAWARE

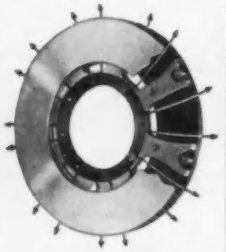
an ACCO product

Tru-Stop Brakes for Construction Equipment

Eimco selects Tru-Stops for New Crawler Tractor

• In designing their new Crawler Tractor, the Eimco Corporation endeavored to provide maximum safety and user convenience. They therefore incorporated TRU-STOP BRAKES—installing a brake on each drive shaft adjacent to the final drive housing, and a third TRU-STOP to brake the bucket operating mechanism.

TRU-STOPS have long been recognized as superior Emergency Brakes for heavy trucks and tractors. Their many advantages are now causing them to be used to brake bucket operating mechanisms, and cable drums on cranes, shovels and other construction equipment.



Longer Lining Life
• The terrific heat generated in braking cuts lining life. TRU-STOPS quickly dissipate this heat. Most of the disc is exposed to the air even during braking. And a cooling jet of air circulates through the disc, prolongs lining life.

These advantages include:

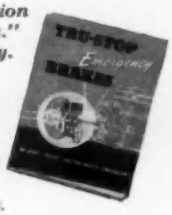
Real Emergency Brakes • On motorized equipment TRU-STOPS are real emergency brakes—not just parking brakes. They serve as auxiliary brakes on long down-grades and can bring the vehicle to a quick stop if service brakes suddenly fail. They prevent accidents by insuring quick positive stops in emergency situations.

Positive Parking Brakes • TRU-STOPS hold safely on steep grades— prevent "parking brake" accidents.

Lower Maintenance Requirements • TRU-STOP design simplifies adjustment or relining, decreases maintenance frequency. In truck or bus applications TRU-STOPS are normally mounted on the drive shaft. Relining or adjustment is a simple job for any mechanic with ordinary tools. It is not necessary to drop the drive shaft.

Specify TRU-STOPS for factory installation on your next piece of equipment.

You will find a great deal of useful information in the booklet, "TRU-STOP Emergency Brakes." Better send for a copy today.



ACCO
TRADE MARK

Automotive and Aircraft Division
AMERICAN CHAIN & CABLE

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other NATO air forces. Sabres equipped with Orenda engines have been ordered by the South African Air Force, the first non-NATO government to order these fighters. Negotiations are understood to be underway with several Latin-American governments. Over 1200 Sabres have been produced since 1950, according to J. G. Notman, general manager of Canadair.

Canadair has also been producing Lockheed T-33 Silver Star twin-seat jet trainers for the Royal Canadian Air Force. More than 500 of these aircraft had been produced by midsummer 1955.

Canadair is now building some of the 50 maritime reconnaissance transports ordered by the Royal Canadian Air Force to cost about $185 million. The planes are patterned on the British Bristol Britannia 100-passenger transports, and use Wright turbo-compound engines.

Also at Montreal are two aircraft engine plants. Rolls Royce of Canada Ltd. is building Nene jet engines for the T-33 Silver Star trainers, and is also doing repair and overhaul work on other Rolls Royce engines used on Canadian military and civil aircraft. Canadian Pratt & Whitney Aircraft Co. Limited, will build the Wright Cyclone engine to power the Grumman S2F sub-hunter plane being built at Toronto. It is also manufacturing parts for Wasp piston engines for which it is now the only world supplier, and is doing other overhaul and repair work.

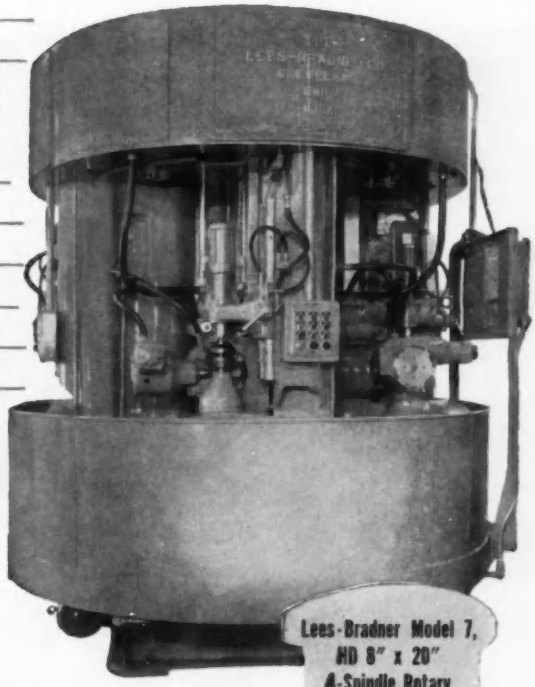
Bristol Aeroplane Co. of Canada has factories at Montreal, Winnipeg and Vancouver where it is doing mainly overhaul work on various Bristol and Wright engines and servicing commercial freighters and military aircraft used in Canada. The plants also build components for other aircraft companies.

At Fort William, Ontario, Canadian Car & Foundry Co. Limited, is building Harvard trainers and Beechcraft T-34A aircraft for the Royal Canadian Air Force and the United States Air Force. It has world manufacturing right on the Harvard trainer, of which in the past few years it has built almost 600. The company has another factory at Montreal where railway equipment and other heavy industrial equipment is made. The Fort William plant also makes trolley buses and gasoline powered buses for transit and motor coach systems. Canadian Car & Foundry was bought this past fall by A. V. Roe Canada Limited, to diversi-

LEES-BRADNER

Sets the HOBBING pace for tomorrow

with 4 machines in 1



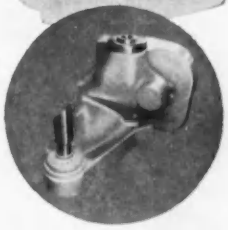
Lees-Bradner Model 7, HD 8" x 20" 4-Spindle Rotary Hobber. Also available in single and 6-spindle models.

Here's a complete hobbing production line in one space-saving unit.

Actually the Lees-Bradner Model 7, H D 4-Spindle Hobber is four separate and independently operative machines in one. Each hobbing unit incorporates basically the same automatic, high-production features as the remarkable 7 HD Single Spindle Hobber. This includes a heavier, more rugged headstock, heavy-duty column and a 10 H. P. motor.

This amazingly efficient machine not only saves valuable floor space but, with its pushbutton controls and automatic features, actually controls the operator thus reducing the chance for human error or slowdown. Chips and coolant are easily carried away from the headstock by the elimination of flat surfaces.

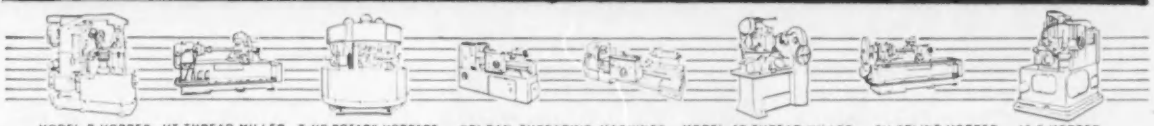
So, if your manufacturing space is valuable and high unit production important, ask your Lees-Bradner representative to give you the story on the ultra-efficient 4-spindle rotary hobber. Write or wire us direct for his name and address in your area.



View of new HD headstock with increased bearing surface between column and headstock, heavier casting, coolant and chip carry-away.

the LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.



MODEL 8 HOBBER · HT THREAD MILLER · 7-HD ROTARY HOBBERS · CRI-DAN THREADING MACHINES · MODEL 40 THREAD MILLER · SH SPLINE HOBBER · 12-S HOBBER

IF YOU THREAD OR HOB . . . GET A BETTER JOB WITH A LEES-BRADNER

"CHICAGO"
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Hydraulic Tappets • Hydraulic Units for Push Rods and Rocker Arms • Mechanical Tappets • Push Rods • Self Locking and Standard Thread Adjusting Screws • Adjusting Screw and Pad Assemblies • Valve Spring Retainers • Split Valve Locks

Connecting Rod Bolts.....Hydraulic Cylinder Pistons
Cylinder Head Studs.....Cylinder Head Cap Screws
Main Bearing Studs.....Main Bearing Cap Screws
Flywheel to Crankshaft Screws.....Diesel Energy Cells
Wheel Bolts and Studs.....Differential Carrier Screws
Oil Pump to Distributor Shafts.....Rocker Arm Shafts
Automatic Transmission Valves.....Water Pump Shafts
Roller Followers.....Ball Joint Assemblies

External and Internal Grinding, Thread Grinding, Precision Roll Threading

Heat Treating • Carbon Restoration • Carburizing • Carbo Nitriding • Cyaniding • Hydrogen Brazing • Complete Metallurgical, Dynamometer and Testing Laboratories

Special Screw Machine Parts 1/16" to 5" Diameter • Cold Upset 3/16" to 1" Diameter • Cap Screws • Set Screws • Nuts • Studs • Taper Pins • Socket Screw Products

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Established 1872

fy the Canadian operations of this British-owned concern.

At Fort Erie, Ontario, near Buffalo, N. Y., Fleet-Doman Helicopters Limited is manufacturing components of the Doman helicopter made by Doman Helicopters Inc. of Danbury, Conn. The company is also making components for other airplane manufacturers and plans to make the Doman helicopter in Canada.

Fairey Aviation Co. of Canada, is located at Halifax and is primarily a service factory for British Fairey aircraft used by the Royal Canadian Navy.

These are the main aviation manufacturing firms in Canada. Major suppliers of components include the British Lucas-Rotax organization, Dowty Equipment Co. of Canada, and Canadian Steel Improvements Limited, all located near Toronto, and making parts for jet engines and hydraulic equipment for military and civil aircraft.

It is estimated that about 60,000 people are employed in the aviation manufacturing industry in Canada, making everything from the smallest parts to the completed military fighter.

BOOKS . . .

DIESEL ENGINE PRINCIPLES AND PRACTICE, *edited by C. C. Pounder, published by Philosophical Library, Inc., 15 E. 40th St., New York 16, N. Y. Price, $17.50.* This volume is a reference book, arranged in twenty-six sections, covering the theory, construction and application of Diesel engines of all types. Each section is a treatise on one aspect of Diesel engineering, written by a specialist in his particular field. The book begins with chapters on the theory and components of Diesel engines, starting with thermodynamic principles and continuing with fuels, fuel injection systems, scavenging arrangements, pressure-charging blowers, heat exchangers, starting apparatus, transmission gear, governors, and so on. Sections follow on torsional vibration, engine balancing and materials. The central part of the book describes different types of engines in ascending order of size, beginning with vehicle and tractor engines and proceeding to engines for railcars and locomotives, air-cooled engines, stationary high-speed engines, dual fuel engines, and marine engines. The book concludes with sections on vibration and noise, testing, and engine maintenance.

AUTOMOTIVE ELECTRICAL EQUIPMENT, *by William H. Crouse, published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. Price, $6.50.* This new, third edition covers the construction, operation, trouble-shooting, servicing, and repair of automotive electrical components, such as batteries, cranking motors, generators, voltage regulators, ignition equipment, horns, switches, and headlights. There is up-to-date information on latest developments, including 12-volt equipment, a-c generators, and the autronic eye.

TRACK WHEEL BEARINGS ARE COMPLETELY PROTECTED

Whether it's tropical muck or crystal sharp Alcan dust, nothing sneaks past the C/R End Face Seals guarding the track wheels of this giant Oliver OC-18 Crawler. And here's why: The mating rings in this steel-on-steel C/R Seal are lapped flat within .000034 inch! They form a leakproof seal so dependable that even under the worst field conditions the oil and the bearings stay clean and the oil level does not require the usual frequent checking. Seal performance like this cuts downtime for lube checks . . . saves big money on round-the-clock operations. You can have equally dependable performance . . . and savings . . . with C/R Oil Seals.

C/R engineers will cooperate with you on special designs, or help select the right stock seal for a wide range of applications. Write for detailed information.

More automobiles, farm and industrial tractors rely on C/R Oil Seals than on any similar sealing device.

CHICAGO RAWHIDE MANUFACTURING COMPANY
1205 Elston Avenue • Chicago 22, Illinois

Offices in 55 principal cities. See your telephone book.

In Canada: Manufactured and Distributed by Super Oil Seal Co., Ltd., Hamilton, Ontario

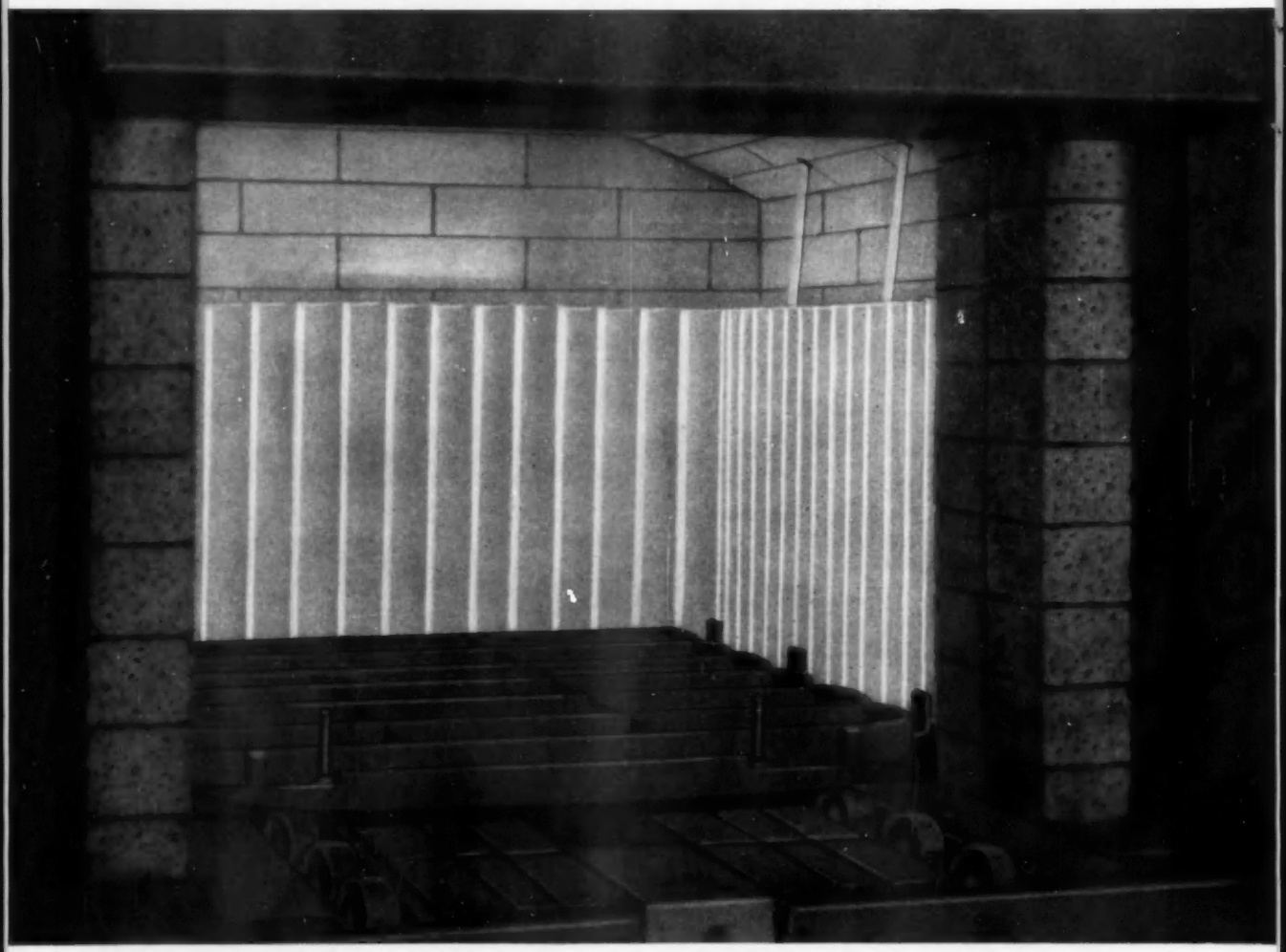
Export Sales: Geon International Corp., Great Neck, New York

OIL SEAL C/R DIVISION
CHICAGO RAWHIDE

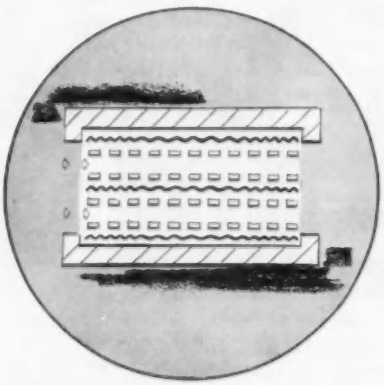
Other C/R Products

Sirvene (synthetic rubber) molded pliable parts • Sirvis-Conpor mechanical leather cups, packings, boots • C/R Non-metallic Gears

BRAND NEW–MODERN ELECTRIC ELEMENT

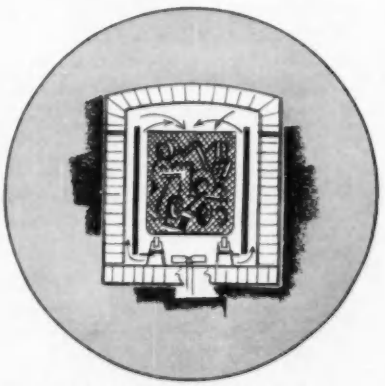


This shows graphically how the new Lindberg CORRTHERM electric heating element actually fills the furnace with walls of glowing heat. Note also that CORRTHERM is conveniently hung from simple brackets requiring no complicated connections or construction. This element operates at extremely low voltage, eliminating shock or short hazards.



In continuous type furnaces CORRTHERM elements hang between lines of work as well as on side walls. Note how closer corrugations (at each end of element) compensate for incoming cold work and door losses.

CORRTHERM elements act as natural baffles to direct forced convection streams through the charge. The use of electric furnaces for carburizing and carbonitriding now becomes completely practical.



No retort needed in pit-type carburizing furnace with CORRTHERM elements. Again see how elements serve as baffles to direct forced convection stream through charge.

FOR LINDBERG FURNACES

Never before has there been an electric heating element like this CORRTHERM by Lindberg. Its revolutionary advantages now make the use of electricity as the source of heat, practical, efficient and economical for all heat treating processes.

Ideal for use in any electric heat treating furnace, CORRTHERM elements have particular advantages for carburizing and carbonitriding. This new element completely eliminates problems formerly created by the use of electricity in these types of furnaces. These exclusive advantages of CORRTHERM explain how and why:

LOW VOLTAGE: Operates at extremely low voltage. No leakage through carbon saturation. Around Lindberg we talk about it as the electric element "without any electricity . . . to speak of!"

ATMOSPHERE CIRCULATION: Elements act as baffles to direct circulation of convection streams.

SAFETY: Extremely low voltage also eliminates shock or short hazards.

DURABILITY: Watts density at all-time low. Element practically indestructible. Work load or operator's charging tool can't hurt it.

EASILY INSTALLED: Element is not enclosed, just hangs in furnace. No complicated mountings required.

If electricity is the preferable source of heat for your metal treating processes find out how advantageously CORRTHERM elements can be applied to your requirements. Just get in touch with your nearest Lindberg Field Representative. (Consult your classified phone book.)

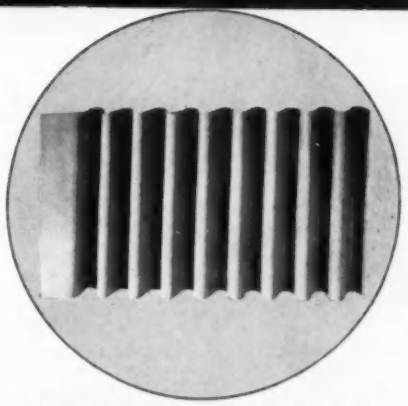
LINDBERG

LINDBERG ENGINEERING COMPANY

2491 West Hubbard Street, Chicago 12, Illinois

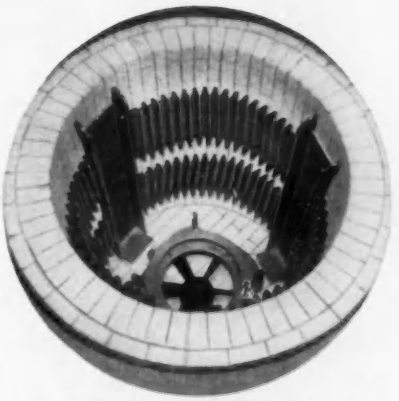
Los Angeles Plant: 11937 South Regentview Avenue, at Downey, California

Associate Companies: Lindberg Industrial Corporation, Chicago • EFCO-Lindberg, Ltd., Montreal, Canada
Lindberg Italiana, Milan, Italy • The Electric Furnace Company, Ltd., Weybridge, Surrey, England
Etablissements Jean Aubé, Paris, France • Lindberg Industrie Ofenbau, Gross Auheim, Germany



CORRTHERM elements are large sheets of corrugated nickel chromium. They were developed in Lindberg laboratories by Lindberg metallurgists and engineers.

This shows installation of CORRTHERM elements in one of two large rotary furnaces currently being erected in the field by Lindberg's associate company, Lindberg Industrial Corporation.



An installation of CORRTHERM elements in a carburizing pit-type furnace. Simplicity of mounting makes replacement easy and economical.

Safety! Extremely low voltage makes CORRTHERM elements completely safe. Let operator or work load bang it if they will. Neither element nor operator will be hurt.

CORRTHERM

by LINDBERG

rugations (at each end of element) compensate for incoming cold work and door losses.

naces for carburizing and carbonitriding now becomes completely practical.

forced convection stream through charge.

National Motor Boat Show

(*Continued from page* 100)

clutch and crankcase plan. Second is a 125-hp model using the IH block enlarged to 264 cu in. A third is a six-cyl, 145-hp, ohv engine, with such truck engine features as stellite-faced valves and all around cylinder jacketing.

The Roosa-Master fuel injection system now is standard on the P & H Diesel Engine Div. line as exhibited. The system on the two-stroke engines automatically retards injection until engine speed reaches 500 rpm, then gradually increases for better idling characteristics, faster acceleration and deceleration, and smoother operation.

White Diesel Engine Div. displayed its new marine version of the 90-deg V-6 engine (See AI, Dec. 15, 1955, page 66). The V-6 is rated at 185 hp, weighs 2825 lb with reduction gears, and operates with Roosa-Master injection. A 125-hp V-4 is to be offered also.

Latest development of Red Wing Motor & Manufacturing Co. is its Meteor 150-hp unit for cruiser use. It provides a seven-bearing counterbalanced crankshaft, full pressure lubrication, and an exhaust manifold with ¼-in. water jacket walls. Universal Motor Co. unvelied a complete vee-drive power unit with gears part of the engine. The so-called Aqua-Pak is offered in 25, 65 and 145-hp sizes.

Among outboard engines, perhaps the most unique was a four-cyl, four-stroke, 35-hp water-cooled unit shown by Fageol Products Co. Based on the firm's inboard model 44 engine formerly known as the Aerojet and developed from the Crosley engine, the unit was revealed for the first time at the show. Fageol is reported to have reached a sales and manufacturing agreement with Clinton to handle that line of outboards.

Johnson and Evinrude have superseded their 25-hp models with a 30-hp engine. Mechanical improvements in the engines include a fuel-saver cam-controlled throttle adjustment for low-speed operation, an elliptical pulley on the starter for reduced starting effort, and improved silencers.

Champion presented a matched port and starboard installation for large boats. Mercury lead its line with a four-cyl in-line 40-hp model, with optional electric starting. The firm introduced its Ride Guide steering, consisting of an enclosed rack and pinion that actuates an enclosed steel cable connected to the engine. The device is not clamped to the hull.

Scott-Atwater featured a 16-hp model and a 33-hp twin which is said to be the largest of this type. A new exhibitor, West Bend Aluminum Co., displayed five motors under its own name, having built engines for Sears, Roebuck for many years. It introduced 12 and 25-hp models. Oliver featured an electric starter and generator working with a 12-v Delco battery on its 15-hp model. Other new Oliver features are rubber engine mounts, 18-mm spark plugs, low-tension aircraft type ignition.

DOLE DV

THERMOSTATS

the accurate temperature control for modern engines

Highly developed for positive operation against the increased pump pressures in sealed cooling systems, and with all types of antifreeze solutions. Helps maintain best engine performance —speeds warm-up—saves gasoline and oil—reduces wear. Gets more heat from the car heater.

Now standard equipment on thirty-seven (37) leading makes of cars, trucks, tractors, commercial vehicles, industrial and marine engines.

Literature sent on request—please use your letterhead.

Control with Dole DOLE TRADE MARK

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1906 Control with DOLE 1956 50th Anniversary

AUTOMOTIVE INDUSTRIES . . .

is your News Magazine of Automotive and Aviation

MANUFACTURING

Colson cures

barrel-truck fatigue with

STRONGER BACKBONE FROM OSTUCO

First experimental models of Colson Corporation's barrel and drum handling truck strained, twisted and snapped under loads below their intended 1,000 pound capacity. Failures increased when the Elyria, Ohio, manufacturer tested trucks with heavy loads over rough surfaces.

Tracing trouble to the "Backbone" (the truck's main structural member), Colson and OSTUCO engineers got together, came up with a 1½" square formed seamless tube to solve the fatigue problem. Since 1947, the redesigned drum handling truck has been serving Colson customers, handling loads up to . . . and above . . . its capacity. Successful? Colson has yet to hear of one failure.

Take your cue from Colson. Quality, cost and production problems work themselves out when you talk them over with an OSTUCO engineer. It's easy to start the process by contacting a nearby OSTUCO sales office, or by writing direct to the Shelby factory.

Unique Single-Source Service at OSTUCO eliminates interplant shipment and error . . . another reason why your product can be improved when components are made from

OSTUCO TUBING

SEAMLESS AND ELECTRIC WELDED STEEL TUBING
—Fabricating and Forging

OHIO SEAMLESS TUBE DIVISION
of Copperweld Steel Company • ***SHELBY, OHIO***
Birthplace of the Seamless Steel Tube Industry in America

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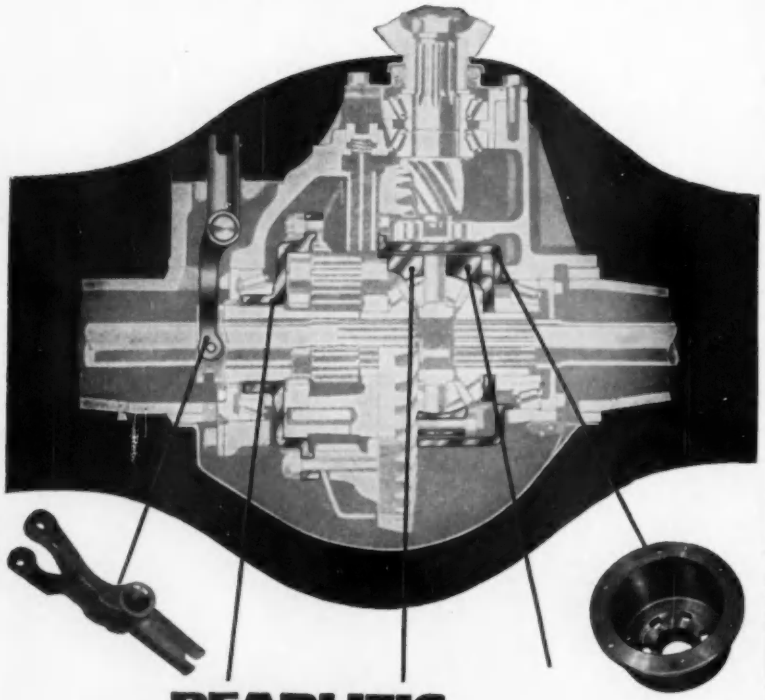
CANADA, *RAILWAY & POWER ENGR. CORP., LTD.*

EXPORT: *COPPERWELD STEEL INTERNATIONAL COMPANY 117 Liberty Street, New York 6, New York*

for **HEAVY DUTY** service



PEARLITIC MALLEABLE CASTINGS

The 2-speed truck axle is a *must* under varying load and road conditions because it provides a tailor-made ratio for every condition. But it takes a severe beating under heavy duty conditions encountered in logging, mining, farming, etc.

That's why Eaton Manufacturing Company, leading producer of 2-speed axles, specifies pearlitic malleable — from National — for several vital parts. For Eaton knows that pearlitic malleable has high ultimate strength . . . resists wear under heavy loads at high speeds . . . possesses excellent non-seizing properties. In addition, pearlitic malleable can be given a smooth finish . . . can be either liquid or air quenched. And perhaps *most important of all, pearlitic malleable machinability index ranges from 80 to 90* (B1112 steel = 100).

Look your product over critically. Pearlitic malleable castings—from National—can replace costlier fabrication methods . . . can offer opportunities of reduction in weight, machining and assembly time. AA-1197

Photos: Courtesy Eaton Manufacturing Company

NATIONAL MALLEABLE AND STEEL CASTINGS COMPANY

Cleveland 6, Ohio

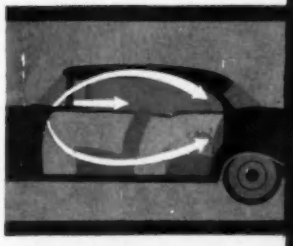
The Nation's largest independent producer of malleable and pearlitic malleable

CALENDAR

OF COMING SHOWS AND MEETINGS

Pacific Automotive Show, Civic Auditorium, San Francisco, Calif. ..... Feb. 23-26
Amsterdam Automobile Show Feb. 23-Mar. 4
Copenhagen Automobile Show Feb. 24-Mar. 4
Leipzig Fair, Germany... Feb. 26-Mar. 8
AMA Electronics Conference, Hotel Commodore, New York, N. Y. Feb. 27-29
ASTM Spring Meeting, Hotel Statler, Buffalo, N. Y.....Feb. 27-Mar. 2
SAE National Passenger Car, Body, and Materials Meeting, Hotel Statler, Detroit, Mich. .....Mar. 6-8
Geneva Automobile Show .....Mar. 8-18
Vienna Automobile Show.....March 11-18
National Association of Corrosion Engineers, annual convention, Hotel Statler, New York, N. Y. Mar. 12-16
Pressed Metal Institute, spring technical meeting, Hotel Carter, Cleveland, O.....March 14-16
Association of National Advertisers, spring meeting, Homestead, Hot Springs, Va. .....Mar. 14-16
American Institute of Industrial Engineers, Conference on Automatic Controls, Cleveland, O. Mar. 15-16
Stockholm Automobile Show.March 16-25
SAE National Production Meeting and Forum, Hotel Statler, Cleveland, O. .....Mar. 19-21
ASTE Industrial Exposition, International Amphitheatre, Chicago, Ill. .....Mar. 19-23
AMA Special Manufacturing Conference, Hotel Statler, New York, N. Y. .....March 26-28
ASLE Annual Meeting, William Penn Hotel, Pittsburgh, Pa..April 4-6
SAE Aeronautic Meeting and Production Forum, and Aircraft Engineering Display, Hotel Statler, New York, N. Y...April 9-13
National Packaging Exposition, Convention Hall, Atlantic City, N. J. .....April 9-12
MPA Annual Meeting and Metal Powder Show, Hotel Cleveland, Cleveland, O. .....April 10-12
National Industrial Research Conference, Sherman Hotel, Chicago, Ill. .....April 18-19
National Petroleum Institute, semi-annual meeting, Cleveland Hotel, Cleveland, O. ..... April 18-20
Turin Motor Show, Italy..April 21-May 2
British Industries Fair, London and Birmingham, England April 23-May 4
International Automobile Show, Coliseum, New York, N. Y. April 28-May 6
AFS Castings Congress and Show, Atlantic City, N. J.....May 3-9
AWS Spring Meeting and Fourth Welding & Allied Industry Exposition, Buffalo, N. Y.....May 8-11
Design Engineering Show, Convention Hall, Philadelphia, Pa..May 14-17
Indianapolis 500-Mile Race.....May 30
AGMA Annual Meeting, Homestead, Hot Springs, Va.....June 3-6
SAE Summer Meeting, Chalfonte-Haddon Hall, Atlantic City, N. J. .....June 3-8
Material Handling Institute 1956 Exposition, Public Auditorium, Cleveland, O. .....June 5-8
Seventh National Plastics Exposition, Coliseum, New York, N. Y. June 11-15

Harrison announces new "OUT-IN-FRONT" air conditioning for four great GM cars!



Cool air from the front . . .
at the temperature you want . . .
directed wherever you want it!

Now's the time to beat next summer's heat!

"Out in front" . . . in every way! Now from Harrison, world's largest maker of temperature control systems for automobiles . . . *four* complete, compact, high-capacity cooling packages—tailor-made for Buick, Oldsmobile, Pontiac and Chevrolet passenger cars! All components—compressor, condenser, evaporator, *everything*—are mounted under the hood, out of sight and out of the way. All air outlets are on the instrument panel—cool, conditioned air flows naturally from front to rear. Radiators, heaters, thermostats, transmission oil coolers, air conditioning systems—Harrison temperature control products are backed by more than 44 years of research and manufacturing experience. If you have a hot or cold problem, look to Harrison for the answer.

HARRISON RADIATOR DIVISION, GENERAL MOTORS CORP., LOCKPORT, N.Y.

Compressor by Frigidaire

HARRISON

TEMPERATURES MADE TO ORDER

SANBORN *Recording Permapaper*

ALL SANBORN 150 SERIES OSCILLOGRAPHIC RECORDERS PROVIDE THESE

SPECIFIC ADVANTAGES

The three foremost operating advantages of a Sanborn "150" are evident in the record, and are given at the right. Equally popular with industrial users is the *wide versatility* of these systems. Each one comprises a basic assembly to which the user adds his choice of an interchangeable, plug-in type preamplifier for each channel. Presently available different preamplifiers now number *eleven*.

Rectangular Coordinate Recording

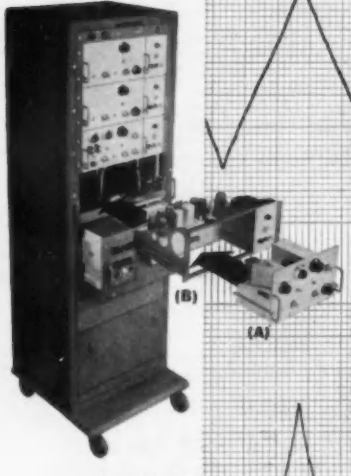
is a Sanborn feature that is especially valuable in multi-channel recording. The user of a 2-, 4-, 6- or 8-channel "150" system can record interrelated events simultaneously on one strip of record paper, and then correlate them against time quickly and accurately, even during the recording.

Clear, Sharp, Inkless Tracings

The nichrome ribbon tip "150" heated stylus removes the white opaque surface of Sanborn recording paper (Permapaper) permitting the black undercoating to show. Tracings are permanent, will not fade or smudge.

Improved Over-all Linearity

resulting from current feedback design of Driver Amplifiers and new shorted coil frame, high torque (200,000 dyne cm.) galvanometers. Maximum error over middle 4 cm. of chart: 0.25 mm . . . over entire 5 cm. chart width: 0.5 mm.



Preamplifier (A) shown in position to plug into a Driver Amplifier with Power Supply (B) which are normally already in place in the Basic Cabinet Assembly

INDUSTRIAL DIVISION
SANBORN CO.
195 Massachusetts Ave., Cambridge Mass.

A new "150" Catalog provides complete descriptive data, specifications and prices on all 150 Systems, Accessories and Cabinets. A copy will be sent on request.

SHORTIES

Private aircraft owners of the U. S. flew more than one billion plane miles in 1954. This is equivalent to 42,000 trips around the world.

●

The steel industry consumed more than 34,000 tons of aluminum in steelmaking operations during 1954.

●

There are 3,012,520 miles of rural roads in the U. S. Sixty per cent of those roads are paved—the remainder dirt.

●

There will be at least 31 million new gasoline buyers in the next ten years.

●

More than 70.5 billion threaded fasteners were produced and used by U. S. industry in 1954 alone.

●

Thirty-five million families in the U. S. own at least one automobile apiece.

●

World civil aviation has flown enough miles of regular air transport in the 10 years since the end of World War II to equal 18,000 round trips to the moon.

●

In 1920, it took 281 manhours to produce a bale of cotton. Today, in large farm operations with oil-powered machinery, the number of manhours required can be cut to 25 or less.

●

Of 54 million U. S. families and other spending units, 23.2 million owe money on installment purchases; 30.8 million are free of installment debt.

●

The miniature lamp bulbs used in 1954 by one division of one automotive company totaled 825 million candlepower, equivalent to the illumination used in 750,000 average American homes.

Lapping For Precision Flatness and Parallelity in Production Quantities

...with a LAPMASTER

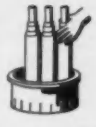
This is the machine for you if you want precision flatness in production quantities at low cost. Lapmasters readily lap to the extreme close tolerance of one light band (.0000116") or less. In addition they produce an extremely fine finish to as low as 1 RMS. They are available with 12", 24", 48", 72" or 84" lapping plates.

THIS IS HOW THE LAPMASTER WORKS

I, a heavy cast iron lap plate revolved slowly under power. **II,** large cast iron conditioning rings are held in position and rotate freely on the lap. **III,** work pieces are placed inside the conditioning ring where they also rotate on the lap. **IV,** a liquid vehicle containing fine loose abrasive flows on the lap plate and is uniformly distributed under the work pieces. At the same time the rotating conditioning rings preserve the flatness of the lap plate. These three essential features, combined with the rapid cutting action of loose abrasive produces a flatness which meets every production requirement.

1 Operator requires no previous lapping experience.

2 Lapping with loose abrasive and without excessive pressure eliminates heat and subsequent distortion.



3 Simplicity of design provides accessibility and allows ease of loading and unloading.

4 Loose abrasive distributed evenly over lapping area insured uniform results.

5 Precision laps identical parts in one cycle or parts of various shapes, heights and materials in one cycle.

6 Lap plate always kept in condition while in operation. No down time required for truing or reconditioning.

Learn more about the possibilities of production lapping and the interesting subject of measuring flatness. The illustrated fact-filled booklets are yours for the asking. Write today.

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CRANE PACKING COMPANY — 38 YEARS — INDUSTRIAL PROGRESS

Development and Design of the
Powermatic Transmission

(*Continued from page* 49)

The wide variations in loading and routes peculiar to truck operation complicate the control problem. However, our aim was not simply to supply ratios that read well on a performance table, but to make certain the right ratio is automatically sent into action at the right time. The control system is no more complex than is required to accomplish that purpose.

With total ratio of up to 7.5-to-1 available for starting, drive range can be used for practically all driving conditions. The range includes the top four geared ratios plus the converter for starting. All starts in this range are made in 3rd gear (2.691-to-1 ratio) times the converter ratio, which, at stall is 2.8-to-1.

The normal shift schedule is as follows: the lock-up clutch engages at 2000-2600 engine rpm, depending upon throttle opening. From 3rd gear the shift to 4th is made at 2600-3800 engine rpm depending upon throttle opening. With light throttle settings the next shift is from 4th to 6th. At wide open throttle the shift is from 4th to 5th, and then to 6th, both shifts coming at 3800 engine rpm.

At 12-30 mph in 6th gear a slight throttle pressure will force a 6th to 5th downshift. Forcing the throttle to detent will give a 6th to 4th downshift. Forcing the throttle through the detent will give a 6th to 3rd or 4th downshift for maximum performance depending upon vehicle speed.

At road speeds of 30-50 mph in 6th gear, forcing the throttle through detent will give a 6th to 5th downshift.

All wide open throttle up-shifts in drive range are made at 3800 engine rpm. Downshifts occur at 2400 engine rpm.

Low range which includes converter and first, first, and second gear is a very specialized range used for maximum tractive effort in moving heavy loads on extreme grades, maneuvering at low vehicle speed where rolling resistance is great, and other like situations where the utmost tractive effort is required.

The normal operation includes: all starts in 1st gear and converter with the converter lock-up clutch engaging at 1800-2400 engine rpm depending upon throttle opening. The shift from 1st gear to 2nd gear occurs at 2600-3800 engine rpm, again depending upon throttle opening.

Intermediate range restricts operation to converter and third, third gear and fourth gear. All starts are made in converter as in drive range.

There is no provision to allow an automatic upshift out of Intermediate under any engine over-speed situation. As such it gives the driver an absolute overcontrol of upshifting.

The converter, an all-aluminum casting, is a four element, single stage, three-phase type with two over-running stators. Torque multiplication is 2.8-to-1 at stall. The seal between the converter and front pump is a Teflon material, chosen for its ability to withstand high temperatures, and its low coefficient of friction. Because the converter is not required to function efficiently as a direct drive coupling, a large share of the usual compromise in blade design is avoided.

Lock-up ordinarily occurs just past the fluid coupling point. When con-

(*Turn to page* 130, *please*)

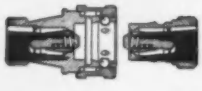
HANSEN

QUICK-CONNECTIVE

2-WAY SHUT-OFF COUPLINGS!

QUICK CONNECTION AND DISCONNECTION

INSTANT AUTOMATIC FLOW OR SHUT-OFF



Seals Both Ends of Line
AUTOMATICALLY INSTANTANEOUSLY

To connect a Hansen Two-Way Shut-Off Coupling, you just pull back the sleeve and push the Plug into the Socket. To disconnect, merely pull back sleeve. No tools required. Similar valves in Socket and Plug shut off both ends of line when Coupling is disconnected—practically eliminate spilling of liquid or escape of gas at instant of disconnection.

Quick Connective Fluid Line Couplings for
AIR • OIL • GREASE • STEAM
HYDRAULIC FLUIDS • VACUUM
REFRIGERANTS • OXYGEN
ACETYLENE • GASOLINE
WATER • COOLANTS

HOSE CLAMPS
HOSE CLAMP PLUGS
HOSE CLAMP SOCKETS
HOSE CLAMP COUPLINGS

FEMALE PIPE THREAD CONNECTIONS FROM ⅛" TO 1"

Hansen Series HK Two-Way Shut-Off Couplings are available with female pipe thread connections from ⅛" to 1" inclusive. Available in brass or steel.

Also Straight-Through and One-Way Shut-Off Couplings. Write for Catalog.

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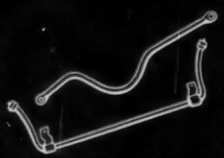
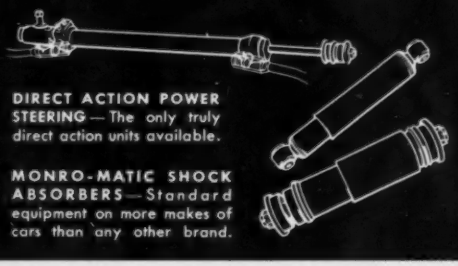
Safety
Comfort
Economy

MONROE

The Greatest name in Ride Control



MONROE SWAY BARS— Standard equipment on 15 makes of cars.



DIRECT ACTION POWER STEERING — The only truly direct action units available.

MONRO-MATIC SHOCK ABSORBERS — Standard equipment on more makes of cars than any other brand.

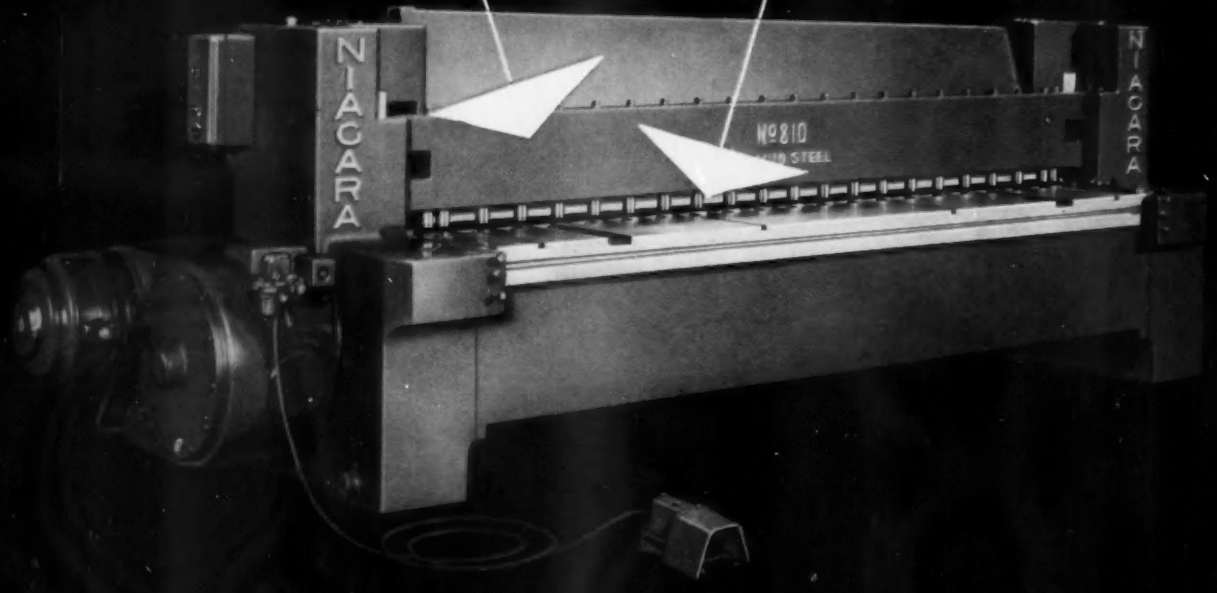
MOLDED RUBBER PRODUCTS — Built for all automotive and industrial applications.

E-Z RIDE SEATS— Standard on more tractors than all other makes combined.

MONROE AUTO EQUIPMENT COMPANY

Monroe, Michigan—World's Largest Maker of Ride Control Products

SELF-COMPENSATING HOLDDOWN



America's Most Complete Line of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work

a BIG FACTOR in the superiority of Niagara Shears

"STRAIGHT-EDGE" CUTTING ACCURACY
Positive, power actuation grips work securely for maximum cutting accuracy.

LOW IMPACT AVERTS DAMAGE AND INACCURACY
Individual pressure feet contact work with low impact, thus safeguarding both the material and bed against damage, as well as reducing noise level. No hammer-blows to mar work. No peening of bed with resulting distortion of knife seat.

SIMPLIFIED, LOW UPKEEP DESIGN
Simplicity of design and construction, involving a minimum number of parts, assures negligible servicing. With *less* to go wrong, there is *less* to repair and replace.

HOLDS WORK FLAT AND STATIONARY
Multiple pressure feet on 6" centers, applying uniform pressure, hold work flat and tight against bed to assure utmost shearing accuracy. No rippling of sheet between feet as cut progresses. Firm grip on short pieces.

HANDLES STOCK OF VARYING THICKNESS
Individual feet are self-compensating, requiring no adjustment for cutting stock of different thicknesses . . . *even at the same time.*

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DISTRICT OFFICES: Buffalo • Cleveland • Detroit • New York • Philadelphia
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In a power squaring shear, no *single* feature nor component can be fully responsible for accuracy, speed and economy. *They* result from a *combination* of features such as the self-compensating holddown; rigid, fully closed box section construction of bed and crosshead; low slope of upper knife; ample and accurately held crosshead guides; multiple point sleeve clutch — the very features that have established the marked superiority of Niagara's Underdrive Series.

For the whole story, straightforwardly presented, on America's most complete line of underdrive power squaring shears, with capacities from shim stock to 1 in. thick mild steel (lengths 3 to 20 ft.), request *Niagara Bulletin 69*. Write today.

NIAGARA

UNDERDRIVE SQUARING SHEARS

YOU CAN REDUCE BOTH COSTS WITH

JOMAC HR GLOVES

Protect your workers with Jomac HR Gloves—and you'll cut your annual bill for safety way down! Jomac HR's provide rugged, dependable hand protection. Made of famous loop-pile Jomac Cloth, they cushion hands against sharp or heavy objects—insulate them against heat. And Jomac HR's really take the bite out of your glove costs—because they last and last. Here's why:

- **they're made of long-wearing brown-and-white mock twist yarn**
- **they're interchangeable; any two make a pair, so each pair provides four long-wearing surfaces**
- **they can be washed or reconditioned many times over**
- **on-the-job tests have proved they outwear other gloves by a margin of 3 to 1!**

Try Jomac HR Gloves for dependable protection and long, economical wear. Jomac makes a complete line of work gloves and wrist-to-shoulder protection. Send for prices and complete details.

JOMAC
INDUSTRIAL GLOVES
PLANTS IN PHILADELPHIA, PA., AND WARSAW, IND.
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☐ Send me prices and data on Jomac HR Gloves

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Name.....

Company.....

Address.....

City.....State.....

Powermatic Transmission

(*Continued from page* 126)

ditions favor delaying the lock-up such as when maximum performance is desired, the driver may do so by forcing the accelerator through the detent position.

A hydraulically actuated lock-up clutch is arranged in parallel with the converter. The hub of the driven plate is splined to the transmission input shaft and carries the converter turbine. The non-metallic friction faces are molded into a single biscuit with internal driving teeth.

The reaction plate is carried by the bolts connecting the converter cover to the converter pump housing assembly, and the pressure plate is driven with the converter cover through dowels.

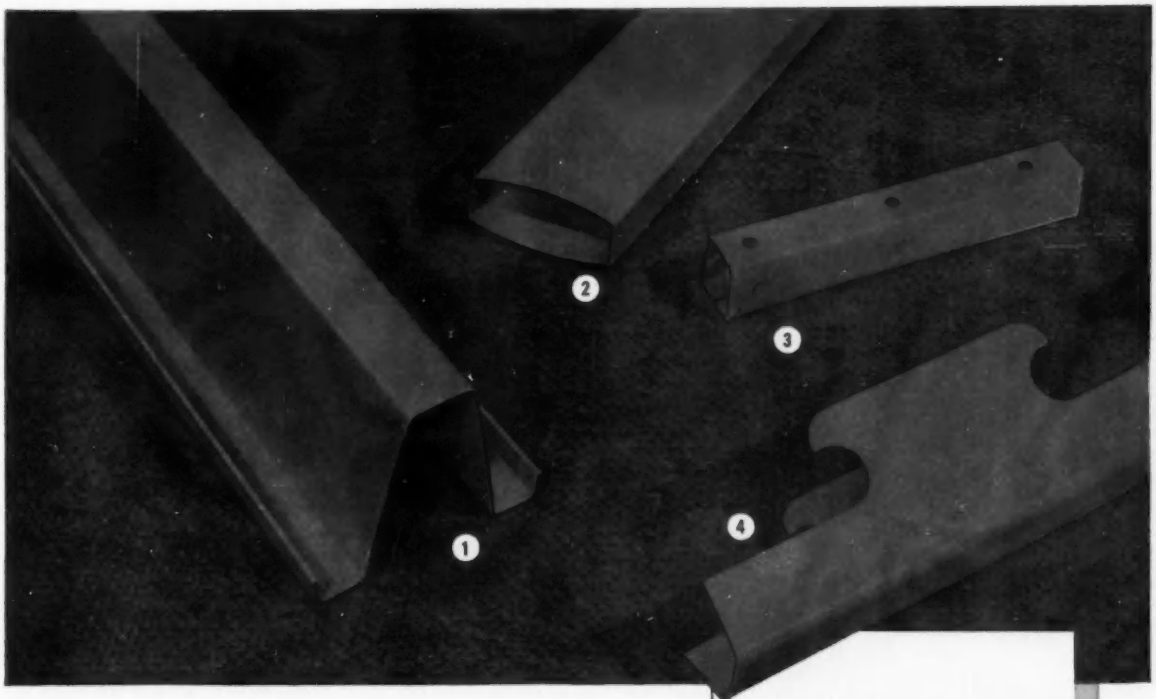
The pressure plate is a shrink fit on its own diaphragm return spring. These two pieces constitute the clutch apply piston. A ring on the pressure plate seals the outside diameter, and the spring forms its own seal against a ring on the hub of the cover assembly. Positive control of the clutch is provided by the following pressure schedule.

When operating in converter, charging pressure is maintained at a sufficiently high level to eliminate cavitation and to provide a circulation rate through the converter that will satisfy the oil temperature requirement. The charging pressure plus the spring force holds the clutch out of engagement during this phase.

Concurrent with the lock-up engagement charging pressure is lowered, and the apply pressure is directed to the forward side of the pressure plate. The raising and lowering of the converter charging pressure, alternately with lock-up clutch apply pressure, assures positive and accurate control of this clutch under all conditions.

The retarder functions, in effect, as a double circuit fluid coupling with the output element grounded. Thus we have the effect of a fluid coupling operating at stall. The impeller is attached to the ring gear of the splitter set. The grounded element is cast as part of the case in the rear and part of the converter ball housing at the front. This vaned cavity in the case is open to the retarder control valve at the lower right hand side.

A foot-operated pedal to the left of the steering column controls movement of the retarder control valve through direct linkage. When the pedal is operated, an exhaust port is



These EXTRA properties make tough forming jobs easy!

HUNTER-DOUGLAS *Pre-painted* ALUMINUM STRIP

Mill quantities available in several aluminum alloys and tempers; wide color range.

UNUSUAL FORMABILITY—Hunter-Douglas coatings are specially compounded for high flexibility, freedom from cracking, chipping or peeling. The pre-painted strip readily roll forms, embosses, stamps... surface coating even stretches sufficiently to permit *deep drawing* without damage.

GOOD EXTERIOR DURABILITY—Finishes are remarkably colorfast in sunlight, resistant to heat and cold and successfully pass 500 hour, 90°, 20% salt spray test with no sign of lifting or blistering.

DOUBLE COATING, with each coat baked, produces a hard, bright, and completely opaque finish with excellent adhesion and resistance to scratching.

COLORS—Available in a wide range of decorative colors with excellent color reproduction.

WIDTHS—Up to 8" maximum and in nominal thicknesses.

For applications subject to severe weather exposure or exceptional forming stresses, for unusual beauty without need for subsequent painting specify Hunter-Douglas Pre-Painted Aluminum Strip... costs a little more, saves a lot!

HAT SECTION roll formed without cracking painted surface. No scratching despite considerable wiping action of multi-diametered rolls.

BOTTOM RAIL FOR VENETIAN BLIND. Unusual flexibility of finish permits roll forming and double lock seaming without breaking painted surface.

KNEE BRACE STRUCTURAL COMPONENT scored for knockouts, then formed to rectangular section without lifting finish. Knockout plugs practically invisible in pre-painted material.

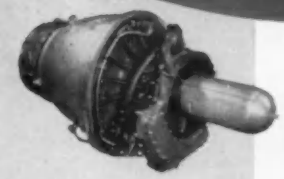
STRINGER blanked from pre-painted strip. Paint adheres tightly to extreme edges. No flaking or lifting to mar finish.

Hunter Douglas Aluminum Corporation

HUNTER-DOUGLAS ALUMINUM CORPORATION, DEPT. AI-2 • RIVERSIDE, CALIFORNIA • TELEPHONE OVerland 3-3030

"Just Over the Horizon"

EXECUTIVE PLANES
with C.A.E. Turbine Power



CONTINENTAL
J69

Compact, easily serviced. 920 lbs. thrust. Single-stage centrifugal compressor, single annular combustor, single-stage turbine; hollow-shaft fuel introduction provides excellent atomization and is non-clogging—eliminates need of high-pressure fuel system.

"The era of jet-powered business aircraft . . . undoubtedly is just over the horizon." . . . This is the conclusion* reached by Herb Fisher, Chief, Aviation Development Division, The Port of New York Authority, after flying the MS 760 twin jet executive transport which Beech Aircraft Corp. has been demonstrating in America this summer. U. S. version of the ship will be powered by Continental J69, raising the service ceiling to 35,500 feet and maximum speed to 410 mph. . . . This pioneer twin jet transport marks an important addition to the list of applications for which the J69 is admirably suited in performance characteristics, and design. The engine is now in production at C. A. E.

*See "Executive Pilot's Report: MS 760", Skyways, August 1955, P. 12.

CAREERS FOR ENGINEERS

Continental Aviation & Engineering Corp. has openings for technically-trained men. Engineers interested in positions with almost unlimited opportunity for advancement, in this new and challenging industry, are invited to write for information.

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SUBSIDIARY OF CONTINENTAL MOTORS CORPORATION

immediately blocked and oil from the pumps allowed to pass through the control valve to the cavity. The oil circulates through the cavity, absorbs energy in the form of heat, passes back through the retarder control valve body at a controlled rate and then is directed to an external oil cooler.

Oil from the retarder is sent to the main regulator valve to increase the holding force of the clutches to meet the increased need. When the pedal is released, the control valve returns to its closed position, the main oil supply is cut off, and the centrifugal pump effect of the impeller forces the remaining oil out of the cavity into the sump. The "feel" of the retarder differs from conventional brake pedal operation because the filling of the cavity is not instantaneous. The retarder gives three ranges of retarding which, at higher engine rpm, is in the region of 300 to 400 hp.

A plate-type heat exchanger is located in the bottom tank of the engine radiator and utilizes the engine cooling system to maintain satisfactory oil temperatures. Tests have shown that the requirements for the engine cooling system were very nearly the same, ascending the grade at full throttle, or descending using the hydraulic retarder.

The governors used in Powermatic employ the familiar pitot tube in a new role. The front governor, by translating turbine shaft speed in terms of oil pressure, determines the lock-up point and influences the 1-2 shift point. All subsequent shifts are influenced by the rear governor which senses output shaft speed. The pitot tubes measure fluid flow.

In each governor, a vaned oil collector ring is attached to a rotating member whose speed may then be measured hydraulically. No amplification is needed. The oil entering the tube acts directly on the control valves involved.

As the oil collector ring rotates, the vanes cause the oil to rotate with it. Since the pitot tube is stationary, the velocity of the oil at the point of contact with the tube is reduced to zero. In addition to the velocity pressure, the tube also measures the centrifugal pressure caused by the weight of the rotating ring of oil. The tube measures the sum of these two pressures, both of which vary with the square of the speed of rotation.

Accuracy depends first upon keeping the oil level constant. A bleed hole from the oil pumps feeds an adequate oil supply to keep the collector ring full, and the open ID of the ring limits the top level which the oil can

for heavy radial loads...

or combined radial-thrust loads from either direction – even at extreme high speeds

BCA

ENGINEERS: Send for a copy of BCA's valuable 100-page "Engineering Handbook." Write on your company letterhead. It's free!

single row, deep groove radial bearings

Precision-designed to sustain heavy radial loads or combined radial-thrust loads, these versatile BCA Conrad type ball bearings are built to the highest standards of material and workmanship.

Large size balls give the optimum ratio of ball diameter to bearing race section at the heaviest stressed points. Deep grooved, "high shouldered" raceways permit the bearing to carry heavy thrust loads in either direction equal to 100% of the radial load rating—even at extreme speeds.

When the job calls for *more* than just another bearing, specify the name you can count on . . . BCA. The name is your guarantee.

BCA

BEARINGS COMPANY OF AMERICA
DIVISION OF FEDERAL-MOGUL-BOWER BEARINGS, INC.
LANCASTER • PENNSYLVANIA

reach. The pitot is a small steel tube welded to a flat plate which in turn, is fastened by two screws to the rear pump body.

The collector ring is a stamping with a series of vanes welded to its inner surface. These few parts constitute the entire governor. The only machining required is the drilled passage in the pitot tube bracket. Adding to the ease of manufacture is the fact that the established tolerances affect control variation by only one half of one per cent.

The gear train consists of four simple, rugged, spur gear planetary sets. A series arrangement of the planetaries allows the first set to become a "splitter" for the 2nd and 3rd forward sets and the 4th or reverse set. Employing the "splitter" principle makes it possible to provide six usable forward geared speeds following a geometric pattern of approximately 39 per cent steps.

All clutches are plate type, either single or multiplate, and are either "direct acting" or "polar lever" applied. The direct acting clutches include the lock-up, splitter high, splitter low and high clutches, all of which carry much lower maximum torque load than is required of the polar lever applied clutches.

It is interesting to note that of the four directly applied clutches, three distinctly different types of clutch plate material are used: Type one, the lock-up clutch which must absorb full engine torque, is a rigidly moulded, single plate biscuit incorporating a synthetic rubber augmenting agent. Type two, the splitter-low clutch, is a fully metallic single plate with sintered facings and steel core. Type three, the splitter-high and high-gear clutches, is constructed of newly developed steel-backed, non-metallic plates.

The four direct acting clutches differ in construction details as well as material. The fully-metallic single plate was chosen for the splitter-low clutch where the slip speeds are highest and heat conduction area the greatest. This single plate, having a mean radius of 4.6 in. and area of about 20 sq in. had better working conditions than its companion clutch, the splitter-high. The high-gear clutch has three non-metallic plates because it must handle high torque loads with less slip speed on engagement than the splitter clutches.

Through the use of the Belleville polar lever, one clutch plate can do the work of many. In the case of the intermediate clutch, which carries the major share of the work, being the starting clutch in drive range, the belleville spring multiplies the piston apply force by 3.25 times. When releasing its stored energy on disengagement, a 360-lb force aids in giving fast, clean breakaway. The low and reverse clutches have a five to one lever advantage to provide the capacity needed for maximum torque requirements. The outstanding advantage of this type of clutch application, lies in the fact the a moderate hydraulic line pressure can be used to produce high torque holding capacity in a clutch with a minimum of active friction members.

The control system main regulator valve maintains mainline pressure at various levels depending upon what gear the transmission is in, the position of the throttle, and the energy absorption of the hydraulic retarder.

To eliminate the need for specially machined valve seats, nylon ball check valves are used throughout the system. The cast aluminum seats have withstood extremely severe testing with no measurable wear or deformation. The valve body and all control valves are situated in one convenient location. They are accessible for servicing by removing the sump pan.

(*Turn to page* 138, *please*)

A conventional set-up to do the same washing, rinsing and drying job on baskets and racks of parts would have been 6x20 ft. . . . 120 sq. ft. The Ransomatic Cabinet Type Machine is only 4x8⅓ ft. . . . a saving of 72% in floor space!

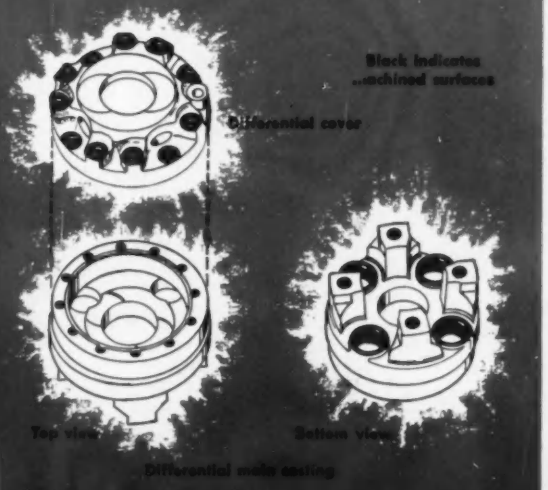
Ransohoff ingenuity offers "big machine" ability in "small machine" design . . . saves time, money, space. It cleans and dries 9 BIG loads per hour; can be designed for parts of any size—up to 18 operations.

Put *your* cleaning problem up to experts: Ransohoff, Inc., 610 North Fifth St., Hamilton, Ohio.

Ransohoff *An old name . . . the newest ideas*

CUSTOMER SPECIFIED

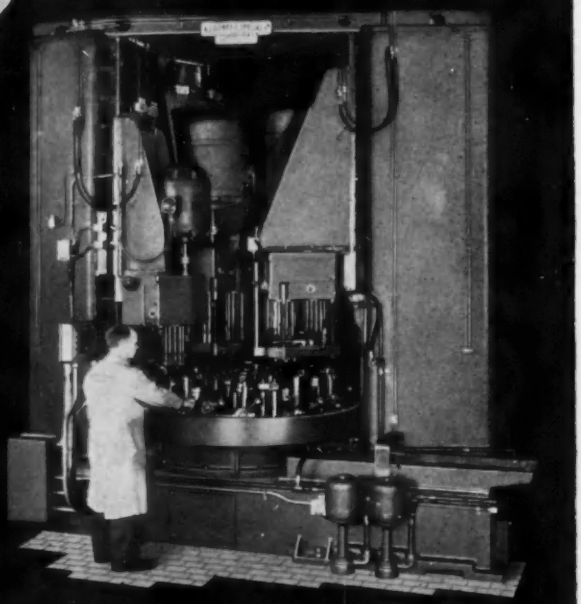
Customer specified a multi-purpose production machine to perform 12 operations in sequence on both the main casting as well as the cover of a differential housing.



KEARNEY & TRECKER DESIGNED

Kearney & Trecker designed this new 88-spindle drilling and tapping machine to complete 134 pieces per hour, 67 covers and 67 main castings.

Machine features rugged columns which provide rigid support . . . and exacting accuracy. Five fixtures, each holding three workpieces, are mounted on a standard Kearney & Trecker 60" rotary index table. Machine employs three vertical drilling heads, each counterweighted. First head has 48 spindles and performs drilling, counterboring, flat bottom drilling and chamfering. Second head carries 28 spindles and handles spotfacing, reaming, boring and trepanning operations while head No. 3 with 12 spindles does tapping operations.



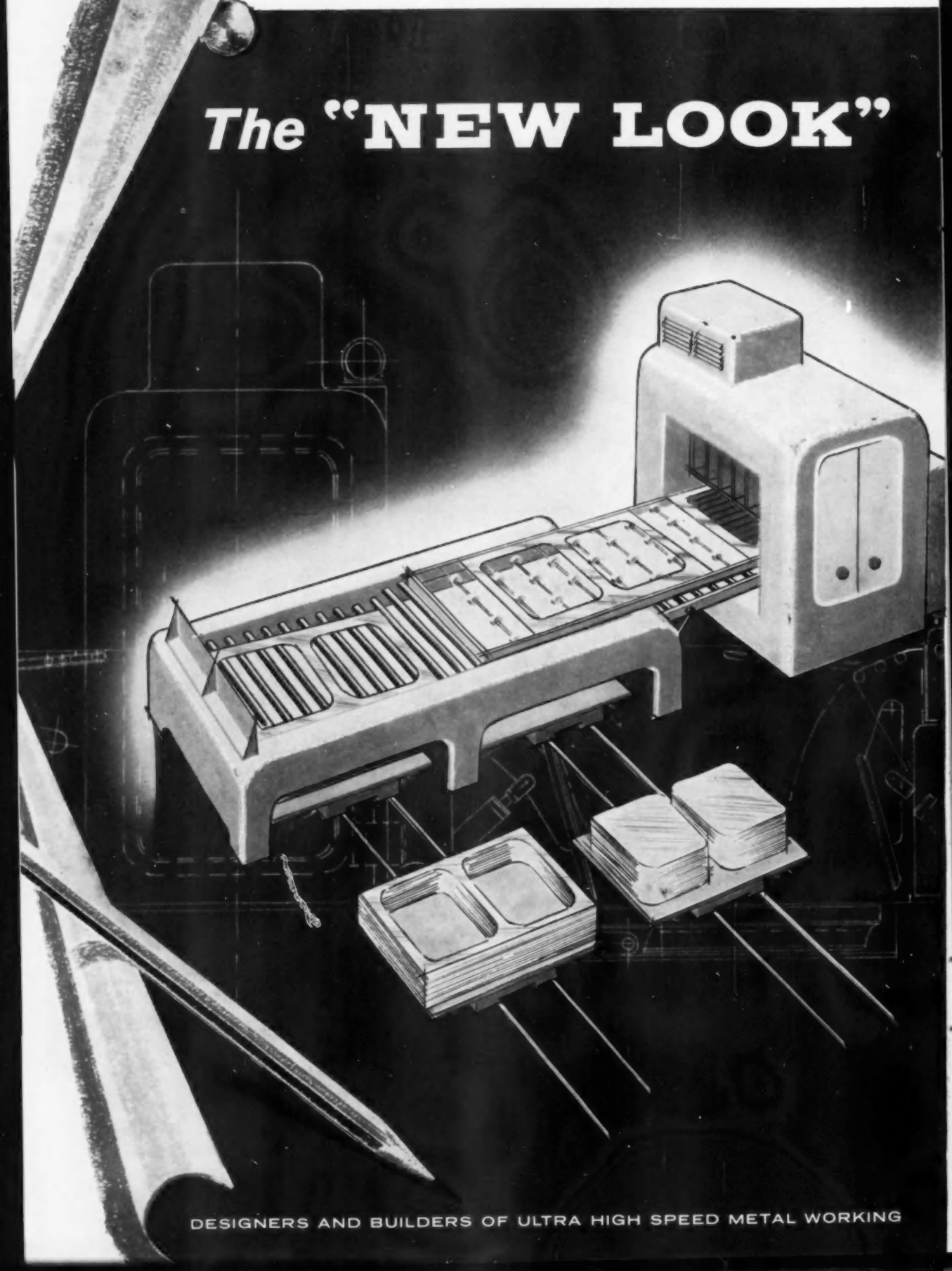
New production efficiency starts with Kearney & Trecker Milwaukee machine tools

This new machine proves that you can rely on Kearney & Trecker's Special Machinery Division to give you the highest production possible at lowest cost. Because with more than 50 years' experience in machine design and manufacture, Kearney & Trecker Corp. has all the ingenuity and skill required to solve high production machining problems.

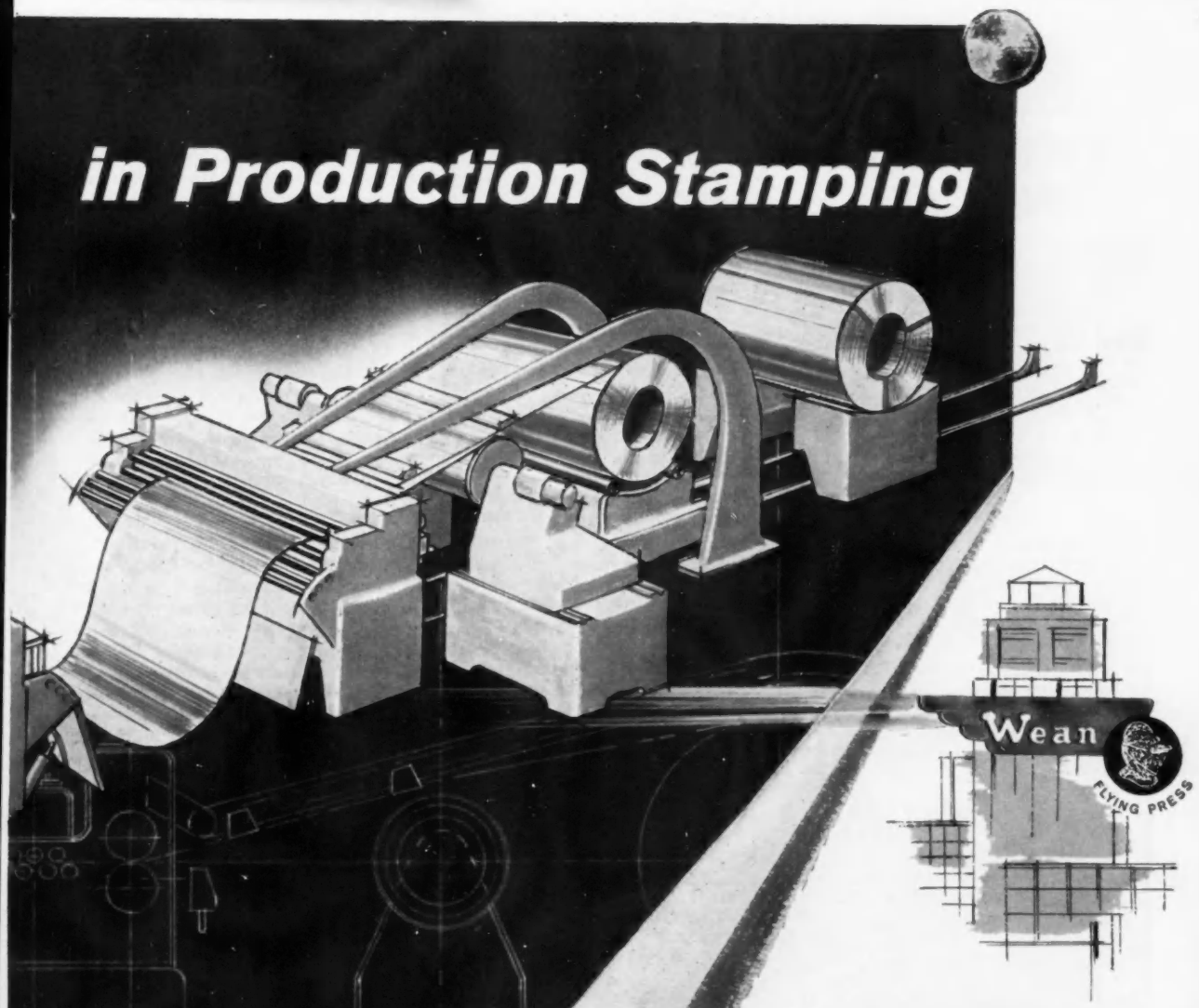
Why don't you take advantage of our abilities? They can pay off in profits for you. Our representative will be pleased to give you all the details. Contact him today, or write Kearney & Trecker Special Machinery Division, 6774 W. National Ave., Milwaukee 14, Wisconsin.

For more details on the machine illustrated ask for Data Sheet No. 1052. Also, free booklet "Doorway to a proven method for solution of big and small metalworking problems" is yours for the asking.

Builders of Precision and Production Machine Tools Since 1898


The "NEW LOOK"
DESIGNERS AND BUILDERS OF ULTRA HIGH SPEED METAL WORKING

in Production Stamping



AUTOMATION for the pressroom is just around the corner according to a number of the nation's leading press experts who have studied the revolutionary "Flying Press" approach recently announced by the Wean Equipment Corporation.

Taking a coil of steel directly from the mill, the Wean Flying Press Line decoils, levels, measures, blanks, sorts, counts and piles the finished piece on trans-car ready to be rolled to the next operation — at a speed heretofore considered unobtainable.

Present engineered lines will handle coils up to 72 inches in width — cutting lengths from 12 inches to 8 feet.

Some of the more outstanding features of the line: floor mounted for quick, inexpensive installation with built-in die loading mechanism; a new coil sticker that eliminates manual threading; a high speed, non-scratch piling mechanism and several newly developed "automated" devices that assure a continual flow of metal through the press.

If low cost, mass production stamping appeals to you, why not contact a Wean Equipment engineer for full particulars? Write direct or call the Wean office in Chicago, Detroit or Newark, N. J.

Wean EQUIPMENT

EQUIPMENT CORPORATION

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Cable: WEANCOR

"LITTLE STEVE" PAYS OFF

THE FINISHING TOUCH

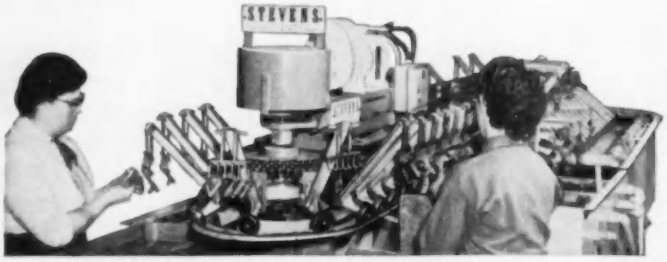
by A. B. HOEFER
vice president
FREDERIC B. STEVENS, INC.

Production Plater Finds Machine Ideal For Zinc Plating

There's a feeling of satisfaction among the people in our company when a Stevens machine is installed and does a better job than the customer anticipated. That feeling reaches all the way from President through engineers, salesmen and typists who write up the specifications.

We are particularly proud of an installation of one of our "Little Steve" machines made recently for the Miller-Smith Manufacturing Company, Spring Lake, Michigan. The partners, John Miller and George Smith, are operating an aggressive business in job buffing and plating, and after receiving some of our literature including a story on the "Little Steve," soon made a purchase from us.

The "Little Steve" fit ideally into their program. The capital outlay met their requirements and the machine is daily turning out a big quantity of zinc plated parts for them. In fact, 105,000 can be plated each working day, which right now is an around-the-clock operation. Just as soon as new racks are built they expect to double present production on some of the parts.



The Miller-Smith management tell us that they are operating much more efficiently now than they did previously with a competitive machine. Parts are being zinc plated to a .0002 thickness every three minutes. They are saving on valuable floor space too, for the "Little Steve" occupies only 162 square feet as compared to 441 square feet used by their previous equipment.

When we asked for comments about the "Little Steve" from Messrs. Miller and Smith, they said: "We are well pleased with the machine —in fact, we're proud of it. We'll be glad to recommend it to anyone." While we are not unused to such comments on our various machines, each new one gives us a warm glow of satisfaction.

This efficient machine fits easily into existing factory layouts because of its size. Only seven feet wide and ten or more feet in length, it can be placed on a factory floor without moving existing machinery.

For further information write to Frederic B. Stevens, Inc., Detroit 16, Michigan.

FREDERIC B. STEVENS INCORPORATED
YOUR METAL FINISHING SUPERMARKET
DETROIT 16, MICHIGAN

METAL FINISHING EQUIPMENT AND SUPPLIES FROM CASTINGS OR STAMPINGS TO FINISHED PRODUCT

BRANCHES:
Buffalo • Cleveland • Indianapolis • New Haven

Powermatic Transmission

(Continued from page 134)

One interesting design detail of the control system is the manner in which the lock-up clutch is momentarily disengaged during shifts. The oil going to all planetary clutches is routed through a metering orifice at the lock-up cutoff valve. While the clutch is filling, the flow of oil causes a pressure drop across the orifice.

The cutoff valve, in parallel with the orifice, receives the high pressure on one end and the low pressure on the other. The valve moves against a spring and exhausts the lock-up clutch. When the planetary clutches are filled, flow stops, the pressure differential disappears and the spring returns the lock-up cutoff valve to its lock-up position. The clutch immediately re-engages. By making the cutoff valve completely dependent upon the rate of fill of the clutches, timing of the engagement and disengagement of the lock-up clutch is made automatically accurate.

Driver controls consist of the accelerator pedal, the range selector and the hydraulic retarder pedal.

A decal on the instrument panel warns the driver against shifting from Drive to Intermediate above 30 mph and from Intermediate to Low above 15 mph. The tell-tale light indicates when the retarder pedal should be momentarily released to allow the oil to be cooled.

The foregoing article is an abstract of a paper presented by the author at the 1956 Annual Meeting of the Society of Automotive Engineers in Detroit.

BOOKS . . .

INDUSTRIAL LUBRICATION PRACTICE, *by Paul D. Hobson, published by The Industrial Press, 93 Worth St., New York 13, N. Y. Price, $8.00.* This book is a guide to sound lubricating practice and its application to cost-saving machine operation and maintenance, and intelligent trouble-shooting. It provides valuable information for the shop superintendent, the maintenance engineer, the stationary engineer, the marine engineer, the machine designer, the repair supervisor, the plant lubrication engineer, and all who are responsible for the trouble-free, efficient operation of machinery, mechanical equipment and the prime movers which drive it.

THE THEORY OF AEROELASTICITY, *by Y. C. Fung, published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price, $10.50.* This book contains a survey of aeroelastic problems, their historical background, basic physical concepts, and the principles of analysis. Additionally covered are the fundamentals of oscillating airfoil theory, and experimental results.

all eyes are on the MOTORAMA

. . . and this "dream car" feature you can sell today!

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AUTOMATIC HEADLIGHT CONTROL

Watch for "WIDE, WIDE WORLD" Sunday afternoons on NBC-TV

Millions will attend the Motorama . . . lured by the excitement of seeing the future on wheels. And they'll see for themselves that Autronic-Eye . . . *proved* and *available* today . . . will be equally important to driving ease and safety tomorrow, too. For here it is, among the glittering features of GM's fabulous "Dream Cars." Follow up this sales-stimulator with Autronic-Eye demonstrations on the road. Profit by this "future" feature *now!*

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FOR MORE LIGHT . . . AIMED RIGHT

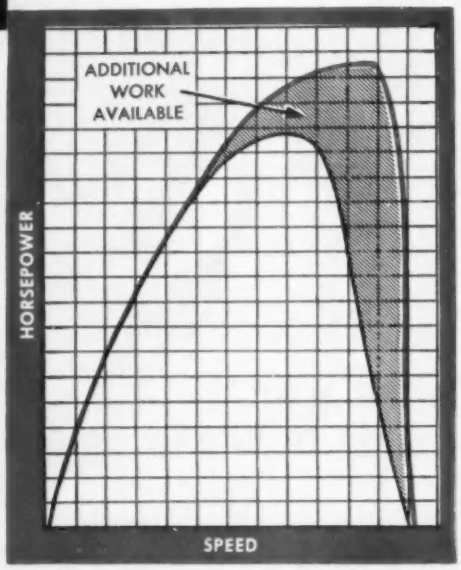
replace old headlamps with new Guide T-3 Safety-Aim Headlamps . . . an exclusive feature of all 1956 GM cars!

Autronic-Eye Package 987310 for 1955-'56 Pontiacs and Chevrolets and 1955 Buicks. 897139 for 1956 Buick cars.

BUCKEYE X-4 ABRASIVE TOOLS

extra power...
same light weight...
greater efficiency...
MORE WORK PER TOOL!

here's proof BUCKEYE X-4 tools deliver extra work



(for even better proof, put an X-4 on your job and get that extra work!)

Look up the toughest metal removal job in your plant, maybe a job that's been fouling up your production schedule for some time. Put a new Buckeye X-4 tool on that job—and stand back!

What happened to the tough job? Why, it's all finished—just like that! And the tool operator's surprised grin lets you know he's never used a tool like this before . . . a tool that whips a tough job quick and easy. With Buckeye X-4 abrasive tools working for you, you'll grin, too—every time you look at that production schedule!

Complete information on these all-new, bright-red Buckeye X-4 abrasive tools will be found in our new Catalog A-10. We'll be glad to send you a copy . . . just tell us where and to whom.

USING BUCKEYE ABRASIVE TOOLS NOW? HERE'S GOOD NEWS!

You can get X-4 performance from your present Buckeye D, E and F Series grinders, buffers and sanders. Just tell us code names and serial numbers of tools you are now operating and we'll tell you how.

Buckeye Tools CORPORATION
DIVISION 21 • DAYTON 1, OHIO

producers of the world's first successful rotary air tools

BOOKS . . .

TECHNIQUES OF PLANT MAINTENANCE AND ENGINEERING — 1955, *published by Clapp & Poliak, 341 Madison Ave., New York 17, N. Y. Price, $7.50.* This book is a report of the proceedings of the annual conference held concurrently with the Plant Maintenance & Engineering Show. A highlight of the volume is the text of more than 1000 questions presented by 2400 executives to the 56 experts, drawn from the nation's leading industrial plants who led the discussions. The question-and-answer section of the book gives a vivid picture of current maintenance problems being faced by the nation's plants. Twenty-three prepared papers were presented and all of them are included with full text, as well as with questions which followed. Sixteen roundtables, without prepared papers, are summarized.

Although most presentations dealt with problems applicable to all plants, five industries drew special attention. These were chemical, food, paper mill and paper products, steel, and textile.

ELECTRONIC DATA PROCESSING IN INDUSTRY, *published by American Management Association, 330 W. 42nd St., New York 36, N. Y. Price, $7.75.* Years of man-hours and millions of dollars are currently being invested in electronic data-processing systems by pioneer firms. These and other companies are assembling answers to questions about management experience with electronic data-processing. This publication is a comprehensive report to management on the latest developments. It describes graphically how automatic data-processing offers unparalleled speed, accuracy, controls, and savings for industry. Also included are reports of company experience with small, medium, and large computers, a summary of the evolution of data processing and its effect on company organization, a forecast of future developments in electronics, and a valuable glossary of programming terms.

DIE DESIGN HANDBOOK, *edited by Frank W. Wilson, published by McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. Price, $14.50.* Planned to cut the die designer's work by more than half on many jobs, the book makes available hundreds of actual designs for cold pressworking. Die design is efficiently tied in with all other factors and functions involved in pressroom processes. Thus the book includes material on product design factors, principles of process planning, theory of metal movement, and die setting principles and selection of presses. The book is fully up to date, including information on properties and pressworking of newer or difficult materials, such as titanium, zirconium, and tantalum, on cold extrusion of steel, and on dies, presses, and operations for the newer hydraulic-action and rubber-action forming methods.

SAFETY IN INDUSTRY, *by D. I. Macfarlane, published by Philosophical Library, Inc., 15 East 40th St., New York 16, N. Y. Price, $6.00.* A general introduction to the subject of safety in industry, this book, written by a British author and comprising 71 pages, gives a number of means whereby plant and premises can be made safer and personal protective measures more effective. Phases covered include the hazards of rotating machinery and the need for guards on presses and similar machines; control of dust and fumes; types of modern protective clothing; precautions against skin diseases; and damage to the eyes and harmful radiations from X-rays and radioactive substances.

Are you looking for better methods for stripping paint?

What's the best way to strip metal parts in large volume?
See page 9

Do certain finishes resist your present stripping methods? Do rejects pile up and cause a bottleneck in your production line? Do you have trouble stripping vertical surfaces of large products?

Oakite's FREE booklet on "How to STRIP PAINT" will help you find more efficient procedures. You'll want to read more about:

- What's the best way to strip paint from metal parts too large to be soaked in tanks? *See page 3.*
- What's the best way to strip large areas of structural metal where a steam supply is available? *See page 5.* Where steam is not available? *See page 7.*
- What are the best ways to prepare stripped metal for repainting? *See page 11.*
- What strippers are best for removing oil-base paints? . . . Synthetic enamels, alkali-resistant plastics or resin-based paints? . . . Japans, wrinkle finishes, nitrocellulose lacquers, alkyds, phenolics and ureas? *See page 12.*

Oakite has more than a dozen fine stripping materials including:

1. Alkaline strippers that remove many types of paint and are also excellent for "killing" the overspray in water-wash paint booths.
2. Solvent strippers that work well on the newer types of synthetic lacquers.
3. A viscous solvent stripper of special value because it adheres to vertical and inverted surfaces like the sides of tanks, shelves of cabinets, etc.
4. An acidic material that strips certain organic finishes and simultaneously removes oil and rust.

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ON OUR WASHINGTON WIRE

Fuel-hungry U. S. military jet planes are to raise their fuel consumption by more than 100,000 bbl per day in the next nine years, Pentagon forecasters now say. Requirements will climb from the present 231,000 bbl to 340,000 bbl per day by fiscal 1965.

Highest Precision

HARDENED & GROUND PARTS

THE ball stud shown here is a perfect example of the precision methods and quality material that go into the production of all Brown Hardened and Ground Parts. Twelve separate operations are employed to produce this vital part. Every feature about this ball stud *has* to be right—every feature *is*. It has strength, wear resistance, precision fit, true-ground spherical and tapered surfaces, close inspection and strict uniformity.

Brown Hardened and Ground Parts have been serving the automotive industry for over 40 years. We refer you to any of our long list of satisfied customers. For information pertaining to your own requirements, simply write or wire.

Henry W. Brown
PRESIDENT

Parts Include . . .
King Pins
Shackle Bolts
Shackle Pins
Brake Anchor Bolts
Countershafts
Idler Shafts
Stub Axle Shafts
Steering Ball Bolts
Beam Balls and Bolts
5th-Wheel Rocker Shafts
Wheel Studs
Water Pump Shafts
. . . anything in the hardened and ground line, of any analysis steel, up to 4¼" diameter.

THE BROWN CORP.

213 BELLEVUE AVE. SYRACUSE, N. Y.

C. H. Ehlert, 3407 Clarendon Rd., Cleveland • N. F. Spring, 4716 Balfour Rd., Detroit • R. C. Sanderson, 5851 N. Ashland Ave., Chicago • Harry J. Windmiller, 1704 Carlton, Fort Worth • Lyle H. Johnson, 1365 Westwood Blvd., Los Angeles, Calif. • John B. Hunt, 5811 S.E. Yamhill St., Portland, Ore.

Better roads for better driving are urged in a new American Automobile Association statement to Congress. Called for is a 15-year roadbuilding program with the Federal share paid by higher taxes on fuels, lubricant, tires, tubes, and camelback.

Defense contractors and subcontractors can expect to hear a lot more from the Government about guided missiles in the months ahead. Top military men are planning to broaden the Pentagon's missile-buying program so as to bring many more concerns into the production picture.

Solid earnings position of U. S. manufacturers is shown in new Federal Trade Commission figures pointing to a record after-tax profit of $10.9 billion in the first nine months of 1955. This income was 34 pct higher than that for corresponding months of 1954.

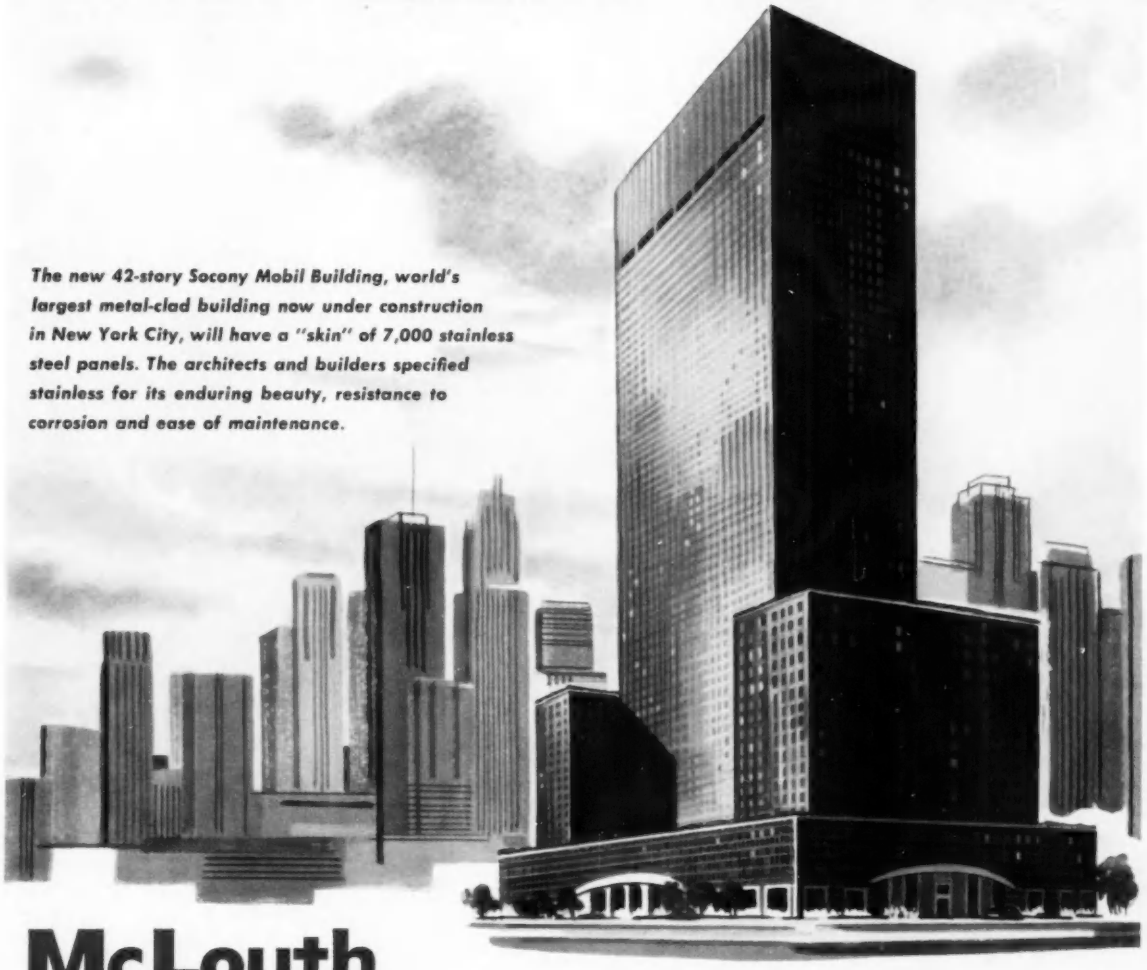
Congress is blocking some of the Administration's plans to close down Government-owned factories in favor of letting industry do the job. A few planned shutdowns evidently will go through on schedule, however.

Government will set aside 150 million lb of aluminum in the second quarter to fill defense and atomic energy needs. This figure is five million lb more than in the current three months.

Government in the past five years has spent $7.7 billion and has granted about $20 billion worth of tax amortization in an effort to get the nation ready to fight back in case of another war. Latest reports from mobilization agencies, however, show that programs for stockpiling materials and machines still have a long way to go.

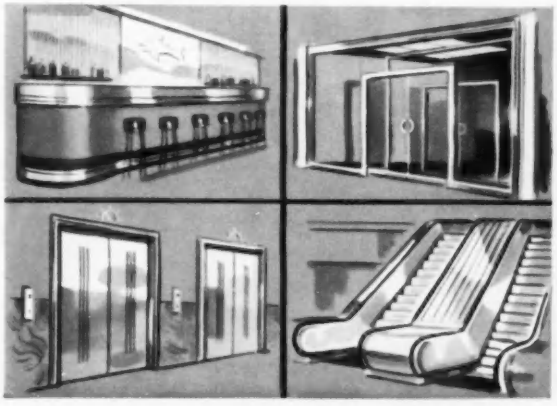
Office of Defense Mobilization will consider 246 applications for fast tax amortization which were frozen out when the agency closed 21 industry expansion goals.

modern design specifies stainless steel



The new 42-story Socony Mobil Building, world's largest metal-clad building now under construction in New York City, will have a "skin" of 7,000 stainless steel panels. The architects and builders specified stainless for its enduring beauty, resistance to corrosion and ease of maintenance.

McLouth
STAINLESS
Steel
for buildings



In fixtures, trim, curtain walls and hundreds of other applications you will profit by using McLouth Stainless Steel.

For the product you make today and the product you plan for tomorrow specify McLouth high quality sheet and strip Stainless Steel.

McLouth Steel Corporation
Detroit, Michigan

MANUFACTURERS OF STAINLESS AND CARBON STEELS

AIRBRIEFS

TUNG-SOL VISION-AID HEADLAMPS

. . . three different sealed beam headlamps
each delivering the illumination
and safety required by today's
automotive specifications

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52 YEARS OF LEADERSHIP
IN AUTOMOTIVE LIGHTING

TUNG-SOL ELECTRIC INC., NEWARK 4, N. J.
Sales Offices: Atlanta, Columbus, Culver City, Dallas, Denver, Detroit, Melrose Park (Ill.), Newark, Philadelphia, Seattle. Canada: Montreal

Miniature Lamps

Sealed Beam Headlamps

Signal Flashers

Radio and TV Tubes

Aluminized Picture Tubes

Special Purpose Tubes

Semiconductors

AIRBRIEFS

(*Continued from page 96*)

tion; of the magnetic field in the vicinity of the earth; and of interplanetary dust.

Rear Admiral F. R. Furth, USN, Chief of Naval Research spoke of PROJECT VANGUARD, a program to design, build and launch a small instrumented earth satellite. They plan to establish at least one earth satellite orbiting around the earth by 1957-58. It will be a sphere about 20 in. in diameter and weigh approximately 21 lbs. An alternate shape, like a cylinder is being considered. To project the satellite up to an altitude of 300 miles and to a velocity of 18,000 mph a three-stage rocket engine is required.

The first rocket unit is to be a modified Viking rocket. Fuel will be liquid oxygen combined with ethyl alcohol, gasoline and silicone oil to provide a thrust of almost 30,000 lb. This will provide a speed of 4000 mph up to 40 miles altitude.

A second stage rocket burning nitric acid and dimethyl-hydrazine will boost the unit to 11,000 mph and to about 130 miles altitude. Coasting from there to the orbital trajectory at approximately 300 miles altitude the third stage rocket will accelerate the satellite to its 18,000 mph velocity.

Then, on its own there will only be some very light air to slow it down (and probably some interplanetary dust bombarding it). It might orbit the earth for as long as two months before spinning earthward to destruction. Meanwhile, its instrumentation will be detecting various phenomenon and telemetering the information down to the ground receiving stations. Admiral Furth stated they are planning to build and launch up to maybe 10 or 12 satellites in this program.

* * *

Borg-Warner to Build Plant For Resin Output in W. Va.

Borg-Warner Corp. has announced the undertaking of a major expansion in the plastics manufacturing field. It has appropriated $10 million for the erection of a modern chemical plant on a recently purchased 322-acre site at Washington, W. Va.

Construction of the plant is said to have been necessitated by a market exceeding B-W's highest expectations for Cycolac thermoplastic resin. Produced by the Marbon Chemical Div. of Borg-Warner, the material at present is manufactured at Gary, Ind.

New Handling System

increases production while eliminating two lines

In one of the automotive industry's newest plants, production of frames for 1955 models was lagging, even though 6 lines were being used. Then Planet engineers were consulted.

They designed and installed a new frame handling system which exceeds current production requirements, doubling the output of the old-style line. *Now only 4 lines are used.* In addition, quality has been improved.

Here's how the system operates. The component parts of the frame are delivered by trolley conveyor to a frame assembly conveyor where they are automatically positioned for tack welding. The assembled frame is then discharged on to the frame welding conveyor illustrated above.

Here the frames are automatically rotated, 90° at a time so that all finished welding is done on a horizontal plane as the frames move by each welding station. Frames are then automatically conveyed through checking, cleaning, and painting operations.

If you have a production problem, why not consult Planet Corporation engineers? Write or phone today. There is no obligation.

PLANET
CORPORATION
1822 SUNSET AVENUE
LANSING, MICHIGAN

- CONVEYORS
- ENGINEERED SYSTEMS
- FOUNDRY EQUIPMENT
- AUTOMATION
- STEEL FABRICATION

"IT PAYS TO PLAN WITH PLANET"

Brazing Jet Stator Blades

(Continued from page 53)

blade fits into a slot machined into the circumference of the carrier ring. A nib on the inner end of each blade fits through a corresponding perforation in the shroud ring. It is this joint that is silver brazed into a single, uniformly filleted butt-and-pierced joint.

The method of assembly is illustrated in Fig. 2. Two carrier rings are placed in a fixture composed of two half circles and the blades inserted in the slots. Next, the operator slips a preformed clip of Easy-Flo (AMS-4770) silver brazing alloy, manufactured by Handy & Harman, on the inner end of the blades. Then, the semi-circular brass shroud rings are fitted to the inner end of the blades. The operator fluxes each joint, brushing the flux over most of the blade to prevent discoloration during brazing. The flux is maintained in a warmer at 90 F because warm flux spreads more easily and adheres better to polished surfaces.

The brazing is done on an Allis-Chalmers Type E1-20B high frequency, 20-kw induction brazing unit. As shown in Fig. 3, the completed assembly and its fixture are clamped into a circular holder mounted on grooved rollers on a panel in front of the induction generator. The shroud ring rests against a three-quarter ring of asbestos-base material which supports the assembly. Heat is supplied by a stationary induction coil which couples to the front and rear of the blades.

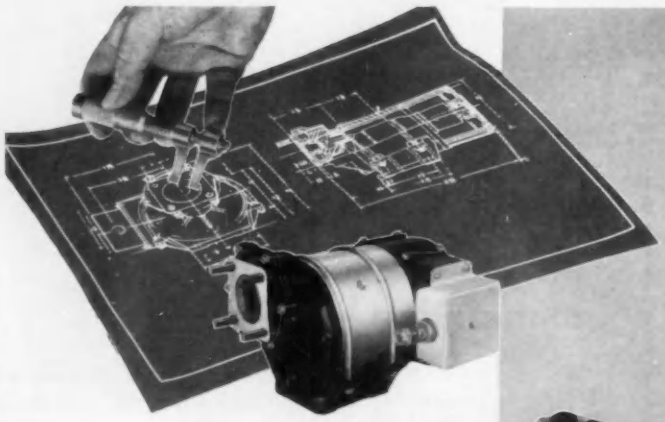
Once the fixture is loaded, the brazing cycle proceeds automatically. On start-up, the rotary fixture remains stationary for about 45 sec of the brazing cycle until the parts come up to temperature, approximately 1170 F. Then the fixture rotates the blade assembly slowly through the induction coils. As each joint passes through the induction heating area, the clip of Easy-Flo silver brazing alloy melts, joining the end of the blade and protruding nib to the brass shroud ring into one solid joint having a smooth fillet of 0.030 to 0.150-in. radius. The 28 joints are brazed in about 10 min. The completed assembly is then washed in a tank of soluble oil, maintained at 150 F, to remove the flux.

Joints must withstand a specified minimum pull of 2800 lb without fracture. Destructive testing is done on sections cut from production samples in a tensile tester. The flange end of the blade is held in one set of jaws and the section of shroud ring held in the opposing jaws. The jaws are designed so that the blade is not damaged during the test and can be reused. The average joint strength obtained is twice the minimum requirements.

MHI Exposition Scheduled For June in Cleveland, O.

The 1956 Material Handling Institute Exposition will be held this year from June 5 to 8 in the Public Auditorium and Exhibit Halls at Cleveland, O. Exhibits will include demonstrations and displays, of the latest material handling products from the smallest to the largest.

Due to the widespread interest in the exposition, exhibit space has been sold out for many months. AUTOMOTIVE INDUSTRIES, along with two other Chilton publications—*Iron Age* and *Distribution Age*—will occupy Booth Nos. 219, 221, and 223.



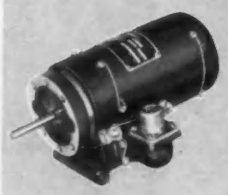
a motor designed to your exact product requirements

For motor-driven office equipment.

Many manufacturers of motor-driven products have found that the use of a Lamb Electric *special application* motor results in better products and lower costs.

Our high degree of specialization in both equipment and methods provides the advantages of custom manufacture on a volume basis. High quality and controlled costs go hand-in-hand.

We shall welcome the opportunity to demonstrate the benefits of a Lamb Electric special application motor for *your* products.



Aircraft pressurizing pump motor.

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In Canada: Lamb Electric — Division of Sangamo Company Ltd. — Leaside, Ontario

Lamb Electric
SPECIAL APPLICATION FRACTIONAL HORSEPOWER MOTORS

YOU GET UNIFORM TEST BAR QUALITY IN LARGE CASTINGS

When you use FRONTIER 40-E Aluminum Alloy!

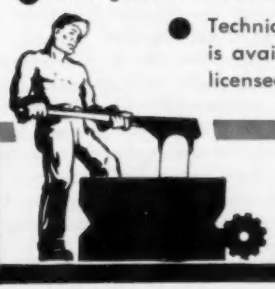
• One of the most unusual features of Frontier 40-E Aluminum Alloy is the fact that the physical properties which spell high quality in the test bar appear uniformly throughout a large casting. And since Frontier 40-E is a non-heat-treated aluminum alloy, the high strength physical properties are obtained by natural aging at room temperatures. The high yield strength of Frontier 40-E Aluminum Alloy is of special value in designing parts that must be light in weight and yet resist distortion or deformation. If your products or parts would be better if they were lighter . . . you need Frontier 40-E Aluminum Alloy.

Here's Proof –

	TEST BAR	AXLE
Yield Strength	23,500	22,700
Tensile Strength	36,600	35,500
Elongation	7.5	7.5

OTHER PLUS VALUES

- Shock Resistance. Exceptional ability to withstand direct and transmitted shock.
- Corrosion Resistance. Even under stress.
- Machineability, Excellent.
- Fine grain withstands high pressure.
- Technical advice and service is available to designers and licensees.



Please send me a copy of the Alloy Data Book giving engineering and metallurgical facts on the physical properties of Frontier "40-E".

Name.....

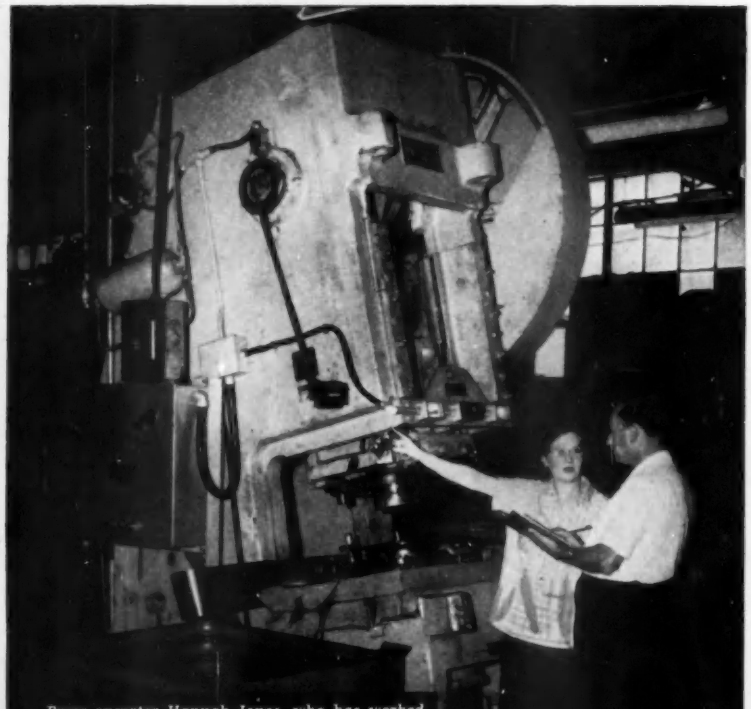
Company.....

Address.....

City.....State.....

FRONTIER BRONZE CORPORATION

4885 PACKARD ROAD, NIAGARA FALLS, NEW YORK



Press operator Hannah Jones, who has worked presses of different makes for several years, prefers this 100-ton Warco to anything she has operated. Here she shows Personnel Director Myron Timms one of the reasons why—the increased production of tractor muffler heads.

"Since We've Tried WARCO Presses We've Bought Nothing Else" - - Says Leading Automotive Muffler Manufacturer

Company That Operates 130 Presses Has Purchased Only Warco Equipment Since 1951

The MacKenzie Muffler Co., Inc., is recognized as one of the nation's leading designers and builders of mufflers for the automotive industry. In the manufacture of their product the blanking and forming press plays an important part. In fact, this concern has more than 100 presses in daily use. In 1951 they decided to try their first Warco Press. They watched it closely, recording production and maintenance figures. "It sold itself to us," say company officials, "so well that we have purchased nothing but Warcos since."

Warco quality is like that. Once you compare you'll discover that Warco Presses outperform them all. It will pay to let your Warco representative know the next time you're in the market for press equipment.

Federal WELDERS ®

Warco PRESSES ®

THE FEDERAL MACHINE AND WELDER CO.
WARREN, OHIO

The BUSINESS PULSE

(Continued from page 98)

seasonal tempo is in progress—or at least was at that time—while credit figures for the month indicate a tapering off in consumer instalment buying. This latter fact tends to give added substance to the recent survey findings of the Survey Research Center of the University of Michigan, which indicate that consumer buying plans are no longer being revised upward.

Finally, aggregate measures of business activity for December hardly showed anything more than a sidewise movement. The Federal Reserve Board's seasonally adjusted index of industrial production, for example, held at its November level, as did the seasonally adjusted index of over-all business activity compiled by the Guaranty Trust Co. Retail sales did run moderately above the November level on an adjusted basis, but even so, they were still not appreciably above those at the end of the 1955 summer period. In this regard it is noteworthy that department store sales, when adjusted for both price changes and seasonal factors, remained virtually unchanged in the four-month period from September through December.

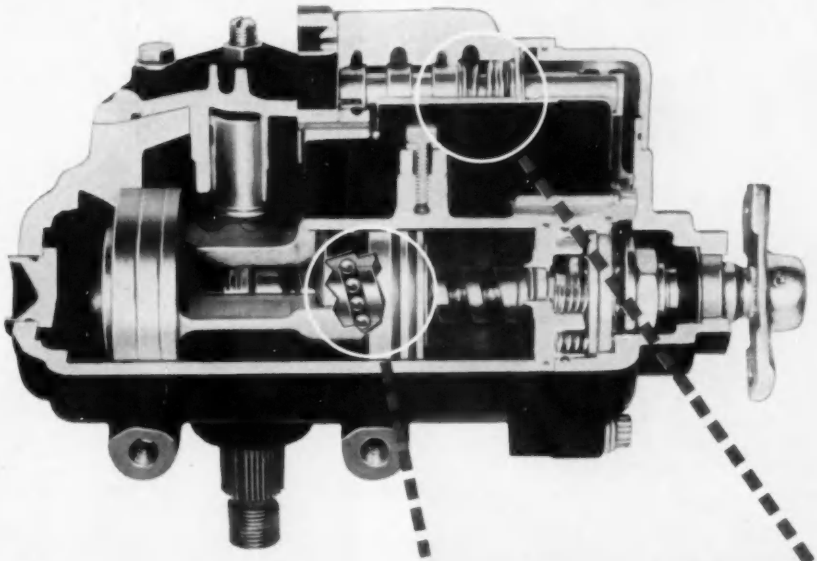
No Actual Business Downturn

This evidence of a leveling-out of activity, of course, does not necessarily herald an actual downturn of general business in the near future. Nor is it incompatible with further growth over the near term, for we may witness merely a period of less rapid advance, reflecting the fact that the slack in the economy has been pretty well taken up. Slackening in some areas may well be offset by advances in others, a possibility which is suggested by current experience in the steel industry, where the cutback by automobile manufacturers has so far found other users clamoring for freed tonnages. That it has not created basic weakness in steel is attested by the recent increases in prices of important steel items.

The consensus still is that business has enough steam to keep it going at least at present levels for a matter of months. Thereafter outlook judgments lack precision, but for the time being there seems to be no serious concern among businessmen, nor, for that matter, anything which clearly justifies such concern.

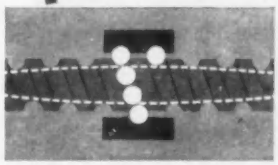
(Turn to page 152, please)

NEW 1956 SAGINAW POWER STEERING SYSTEM INTRODUCES TWO EXCLUSIVE ADVANCEMENTS

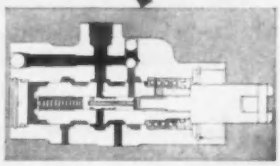


1 New "Parking Valve" automatically limits manual effort to 5 lbs.

With this compact, simplified "in-line" unit, Saginaw engineers have made parking almost *twice as easy* as with ordinary power steering. Saginaw's famed "feel of the road" is still provided by hydraulic reaction, which automatically keeps manual steering effort proportional to the turning resistance of the wheels on the road. During parking, however, the reaction pressure is restricted to 250 psi by this ingenious limiting valve, so steering effort never exceeds five pounds.



Exaggerated diagram of ball nut and steering worm, showing "plateau" in center of thread, which tapers toward each end. Preload keeps gear snug on center, while taper assures easy turning, fine returnability.



Magnified diagram of "parking" valve in center of hydraulic control valve. When reaction pressure reaches 250 psi, this limiting valve automatically shuts off oil supply, restricting manual effort to maximun of 5 lbs.

2 New Pre-Loaded Worm gives "Micrometer" control on highway

The new 1956 *Safety* Power Steering System helps to hold the car straight "on course" by means of this precision pre-load directly on center of the steering worm. This keeps the gear snug on center, providing extremely precise control on straightaways. There is much less tendency to "wander" in gusty crosswinds. This feature lets you drive *more relaxed*, without constant steering corrections—great on long trips!

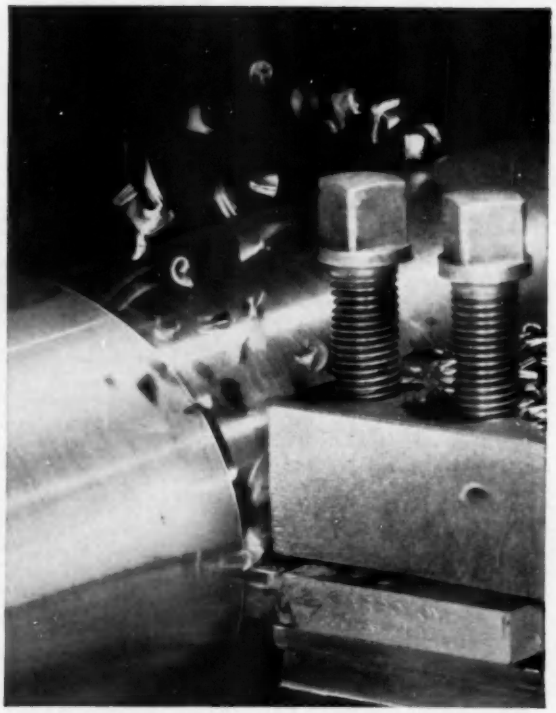
New *Safety* Power Steering is standard equipment on all 1956 Cadillacs, Buick Roadmasters and Supers, and Oldsmobile Ninety-Eights; on all other 1956 Buicks, Oldsmobiles and Pontiacs (and linkage type on Chevrolet) optional at extra cost. Saginaw Steering Gear Div. of General Motors, Saginaw, Mich.

new Safety POWER STEERING by Saginaw

OVER 2 1/2 MILLION SAFETY POWER STEERING SYSTEMS ARE NOW IN SERVICE

FOUR POSITIVE STEPS YOU METAL AT THE LOWEST

Carboloy Machinability Computer accurately determines most efficient setup conditions.



Carboloy Grades 350 and 370 cut faster, wear longer. (Picture taken at 1/1000 second).

1 Solve machining problems with the new Carboloy® Machinability Computer, and you'll cut out hours of nonproductive setup time, and eliminate wasteful tryout runs. Faster, more accurately than any other method, the Computer determines the most efficient operating conditions for both simple and complex jobs.

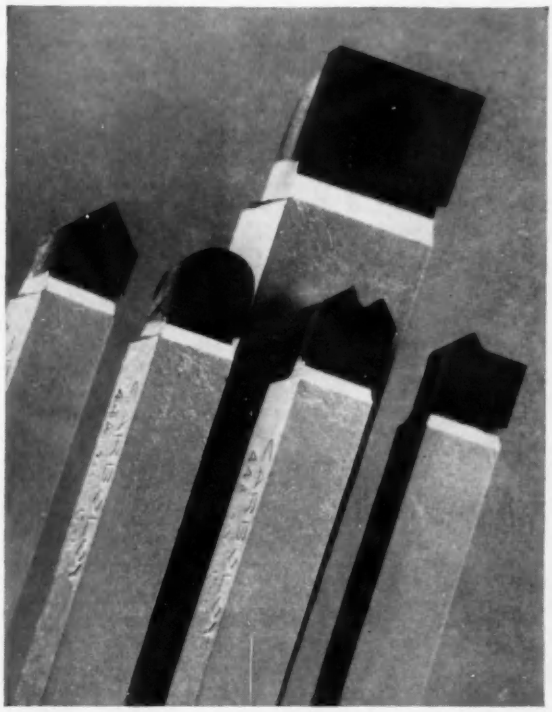
In seconds, it calculates the effect of the 19 most critical machining variables on the material to be cut, the cutting tool, and the cutting conditions. It shows how to set up optimum cutting conditions the first time a job is run, as well as how to improve existing setups. Price of the Computer is $495, f.o.b. Detroit.

2 Cut steel with Carboloy® Grades 350 and 370, and you'll increase production while reducing downtime and tool costs. Hundreds of in-plant comparison tests have proved these grades greatly outperform conventional carbides . . . providing the lowest tool-cost-per-piece of any carbide on the market today.

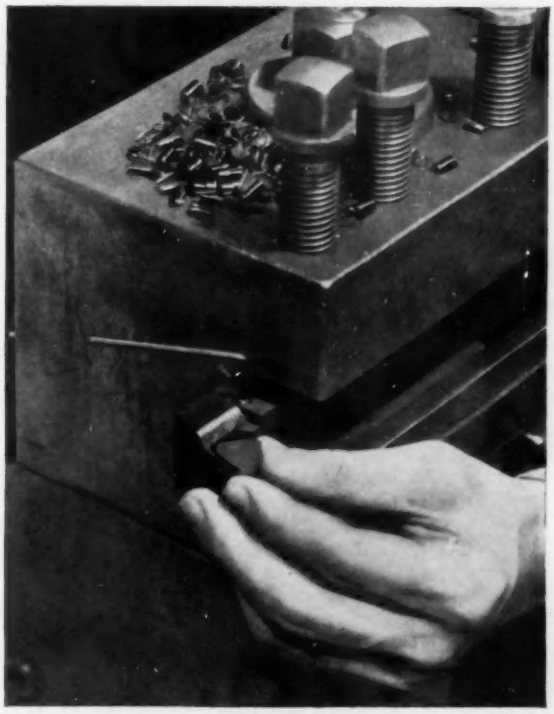
There are no "equivalent grades" for Carboloy 350 and 370, because these grades have a built-in structural rigidity that enables them to take deeper, more punishing cuts without the edge deformation encountered in other carbides. They will cut faster, wear longer, and get more production from your existing machine tools.

Consistent use of these Carboloy products will help you get maximum output from your machine tools . . . at lowest possible cost. For more information and tooling assistance, contact your local Authorized Carboloy Distributor (listed in the Yellow Pages of your phone book), or your Carboloy Representative.

CAN TAKE NOW TO CUT POSSIBLE COST



Style C Standard Carboloy Tool and typical special shapes quickly adaptable from it.



New Carboloy Toolholders can be indexed quickly, easily . . . right in the machine.

3 Apply Standard Carboloy Tools wherever possible, and you'll eliminate many higher cost "specials," while reducing over-all single-point tool inventories by as much as 30%. By standardizing, you will be using only 13 basic styles —"as is," or ground to special shapes – on up to 80% of your setups where braze-type tooling is used.

There are no inventory problems when you use "standards." These versatile tools are stocked in grades to handle any job from roughing to finishing on metals or nonmetals. You can get immediate delivery and tooling assistance from your local Authorized Carboloy Distributor.

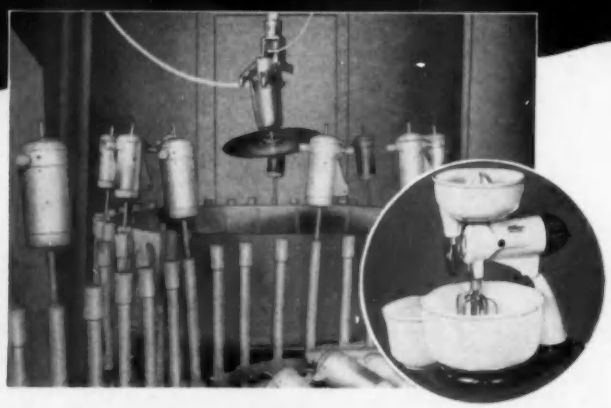
4 Make maximum use of the new, easier-to-use Carboloy Toolholders, and you'll reduce tool-change time and lower insert costs. These holders employ a special clamping device combined with a carbide chipbreaker, which makes it possible to index a blank rapidly and accurately without removing the holder from the machine.

In addition, they utilize a shock-absorbent pad beneath the cutting blank, to permit the use of thinner, more economical inserts at increased speeds and feeds. And, because they are versatile, precision tools, they can be quickly adapted to many jobs you are now forced to tool with costly "specials."

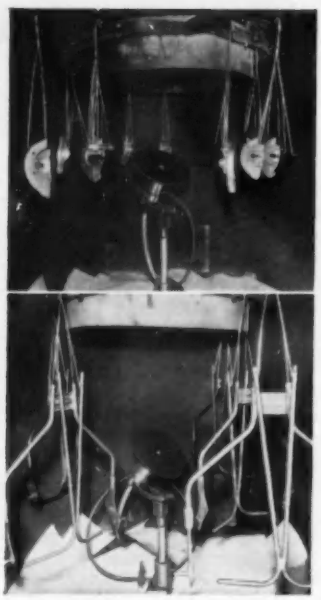
CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY
11151 E. 8 Mile Ave., Detroit 32, Michigan

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

Sunbeam is particular about the uniform high quality finish on their products, so SUNBEAM relies on RANSBURG NO. 2 PROCESS Electrostatic Spray Painting



Along with improving the quality of the brilliant white finish on Mixmaster parts, an 80% paint savings was achieved when SUNBEAM switched from hand spray to RANSBURG Electrostatic Spray Painting



Protective clear lacquer is applied to upper saw guard (upper left) with RANSBURG NO. 2 PROCESS on this line in SUNBEAM's plant 2, Chicago. Other hardware items, including the Drillmaster and Sunbeam Sander are lacquer-coated electrostatically here. Lawn mower parts, such as the handles shown (lower left), the Rain King lawn sprinkler base, and the Sunbeam Fryer base also are painted efficiently with Ransburg No. 2 Process Electro-Spray.

Regardless of the type of product you manufacture, if it's painted—and if your production justifies conveyorized painting—you should look into the savings and improved quality which can be yours with one of the Ransburg Electrostatic Processes. May we tell you about complete Ransburg services, including the test painting of your products in our laboratories?

Write to Dept. A

Ransburg ELECTRO-COATING CORP.
Indianapolis 7, Indiana

RANSBURG

The BUSINESS PULSE

(Continued from page 148)

The Budget for Fiscal 1957

A budget, as the President has observed, is not just a book of figures describing fiscal operations, but rather it is a comprehensive plan of action which affects every phase of life and activity in the nation. As such it is, of course, of tremendous interest and importance to the business community.

The budget which President Eisenhower submitted for the fiscal year which begins next July 1—fiscal 1957—is of particular significance, since it seems to mark a break with policies which the Administration has followed heretofore. In a sense it may be said to represent a selective mixture of "conservative" and "liberal" tendencies. On the one hand, it achieves the orthodox objective of balance between income and outgo, as is indicated by the following tabulation. On the other, it involves larger tax receipts than in fiscal 1956 and provides for an upturn in Federal spending, part of which is earmarked for an enlarged "welfare" role by the Government.

BUDGET TOTALS
(Fiscal years in billions)

	1956 Estimated	1957 Estimated
Receipts	$64.5	$66.3
Expenditures	64.3	65.9
Budget surplus	.2	.4

The achievement of a balanced budget is, of course, no mean accomplishment. It reflects a combination of favorable factors involving both receipts and expenditures. A sharp cutback in Federal spending in fiscal 1954 and fiscal 1955 (totaling almost $10 billion) brought balance within reasonable striking distance. The final closing of the gap, however was occasioned by a large increase in revenue, deriving from the acceleration of business activity. The increase in revenue between fiscal 1955 and what is estimated for fiscal 1956 amounts to some $6 billion.

Less Emphasis on Retrenchment

Welcome as this is to most businessmen, there is a measure of disappointment in the fact that the Administration now appears to have abandoned its earlier emphasis on

(Turn to page 154, please)

Engineered by Tinnerman...

NEW SNAP-ON MOTOR CLIP REPLACES 4 PARTS

Cuts Assembly Time and Costs!

If you manufacture or use fractional horsepower motors, this new Tinnerman SPEED CLIP® can lower your parts and assembly costs by eliminating 4-piece screw clamps to hold motors in place.

Made of high-quality spring steel, this SPEED CLIP is quickly snapped into place over the resilient motor-mounting ring, using a simple hand tool. It forms a vibration-proof lock that won't shake free. Assembly time is reduced because of the one-piece construction . . . no loose parts to handle, nothing to tighten. Parts cost and assembly cost are reduced as much as 75%!

These SPEED CLIPS can be provided in sizes to fit any fractional-horsepower motor. They are designed to hold tight even under severest vibration and high starting-torque in any mounting position.

Ask your Tinnerman SPEED NUT sales engineer for more information and arrange for samples to test on your own assembly line.

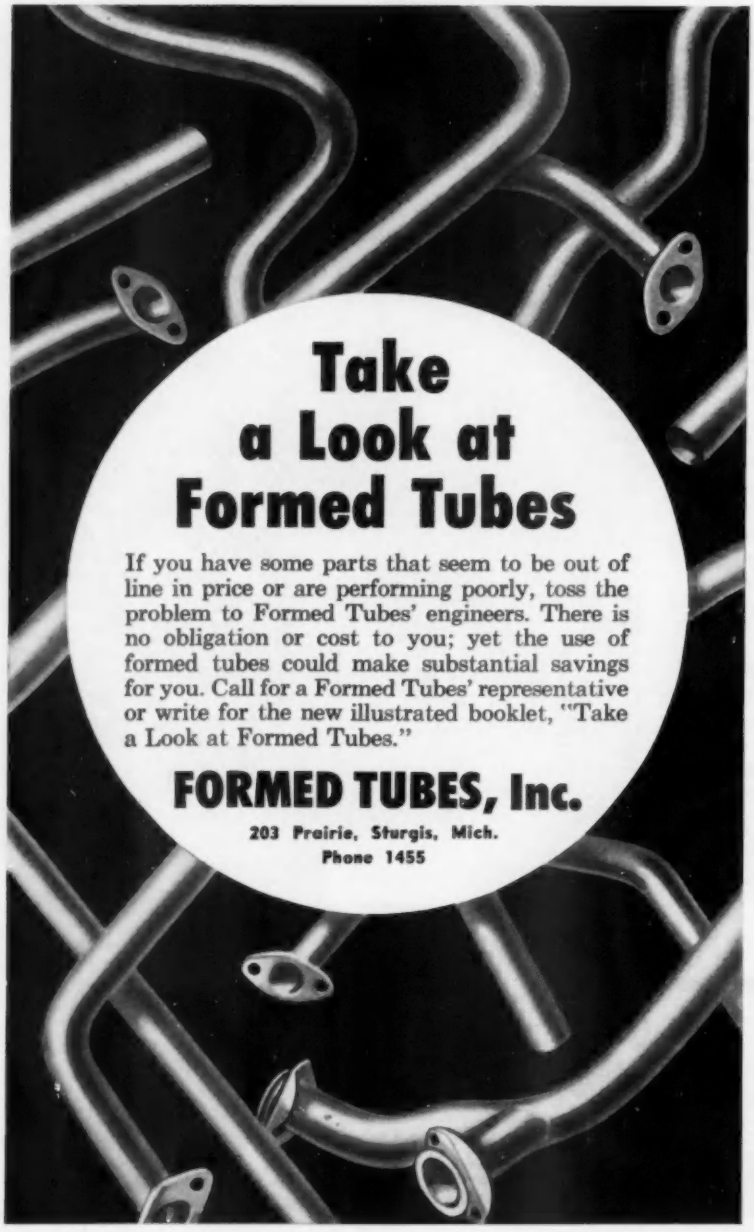
TINNERMAN PRODUCTS, INC. • Box 6688, Dept. 12, Cleveland 1, Ohio
Canada: Dominion Fasteners, Ltd., Hamilton, Ontario. *Great Britain:* Simmonds Aerocessories, Ltd., Treforest, Wales. *France:* Aerocessoires Simmonds, S. A., 7 rue Henri Barbusse, Levallois (Seine). *Germany:* Hans Sickinger GmbH "MECANO", Lemgo-i-Lippe.

TINNERMAN Speed Nuts®
FASTEST THING IN FASTENINGS®

BUSINESS PULSE

(*Continued from page* 152)

retrenchment, at a time when the spending total is still appreciably above the objective of $60 billion set in the 1952 election campaign. This is especially so because a sizable part of the proposed increase in Federal spending for fiscal 1957 is scheduled for a broadening of the "walfare" or "paternalistic" activities of the Federal Government, which used to be regarded as predominantly the concern of State and local governments. The budget involves new emphasis on such activities as public health programs, school programs, community development programs, and so forth, which the Administration apparently feels cannot be adequately conducted by traditional means. Some 57 per cent of the $1.6-billion increase in spending, however, is accounted for by higher military outlay, most of which reflects the growing importance of technologically improved weapons.


Take
a Look at
Formed Tubes
If you have some parts that seem to be out of line in price or are performing poorly, toss the problem to Formed Tubes' engineers. There is no obligation or cost to you; yet the use of formed tubes could make substantial savings for you. Call for a Formed Tubes' representative or write for the new illustrated booklet, "Take a Look at Formed Tubes."
FORMED TUBES, Inc.
203 Prairie, Sturgis, Mich.
Phone 1455

New Defense Facilities

SUPPLEMENTING the list of Certificates of Necessity issued up to Dec. 14, authorizing new or expanded defense plant facilities for the manufacture of automotive and aviation war goods which was published in the Jan. 15 issue, page 132 of AUTOMOTIVE INDUSTRIES, the following additional certificates were announced by the Office of Defense Mobilization, covering the period which extends from Dec. 15 to Jan. 11, inclusive.

The figure appearing in parentheses is the percentage authorized in respect to actual fast tax write-offs.

BELL AIRCRAFT CORP., Wheatfield, New York
Research and development—$54,444 (60)

BENDIX AVIATION CORP., Scintilla Div., Sidney, New York
Aircraft parts—$366,700 (40)

COLLINS RADIO COMPANY, Richardson, Texas
Research and development—$2,212,821 (45)

FENWAL, INC., Ashland, Mass.
Military aircraft components — $14,577 (70)
Military aircraft parts—$38,872 (70)

GOODYEAR AIRCRAFT CORP., Litchfield Park, Arizona
Aircraft parts—$115,000 (40)

INTERNATIONAL BUSINESS MACHINE CORP., Oswego, New York
Components for military aircraft — $9,066,000 (35), $3,300,000 (65)

KEARFOTT COMPANY, INC., Little Falls, New Jersey
Military aircraft instruments — $64,788 (65)

KEARFOTT COMPANY, INC., Black Mountain, North Carolina
Military aircraft instruments — $119,443 (85)

THE GLENN L. MARTIN CO., Middle River, Maryland
Military aircraft—$253,991 (65)

SOLAR AIRCRAFT CO., Des Moines, Iowa
Military aircraft engine parts—$112,413 (55)

UNITED AIRCRAFT CORP., Pratt & Whitney Aircraft Div., East Hartford, Conn.
Military aircraft engines—$504,000 (65)

WESTON HYDRAULICS, LTD., North Hollywood, Calif.
Aircraft parts—$54,384 (70)

Aeroproducts Propellers Are Chosen for Hercules

Selection of Aeroproducts turbo propellers for installation on the Air Force Lockheed C-130 Hercules combat cargo plane has been announced by Allison Div. of General Motors Corp. Built by Lockheed Aircraft at its Marietta, Ga., Div., the Hercules is the first turboprop aircraft to be ordered in production quantities by the Air Force.

Powered by four Allison turboprop engines, the Hercules weighs 62 tons and is designed to carry many types of heavy military equipment. Use of short runways and unimproved fields for landing is made possible by the reversible propellers.

Instant shifts on the go

BIG NEW ADVANCE in shovel-type loaders is the Hough Model HO 4-wheel-drive PAYLOADER.

And one of the biggest features of this 2-yard workhorse is its great new TORQMATIC DRIVE designed by Allison expressly for shovel-type loaders.

Hough calls this integrated TORQMATIC Converter-Transmission team the "easiest-operating, fastest-acting, most efficient power-shift transmission ever put into a tractor shovel."

And they also say that the TORQMATIC DRIVE *permits "instant shifting from any speed range to any other on the go —no stopping, no foot clutching."*

That means faster job cycles, easier loader operations, more yardage moved per shift.

The HO PAYLOADER is available with either gasoline or Diesel power. The engines will last longer, operate more efficiently driving through a TORQMATIC Converter because it instantly matches engine speed and torque to the load—multiplies engine torque up to 350% to broaden the *working* horsepower range.

Today Allison's new TORQMATIC DRIVE is available in many models of shovel-type loaders—will soon be offered in a wide range of other equipment made by leading manufacturers.

If you'd build or buy a better product, get full information on this great new TORQMATIC DRIVE by writing to Allison Division of General Motors, Box 894A, Indianapolis 6, Indiana.

GM TORQMATIC

Allison
TORQMATIC DRIVES

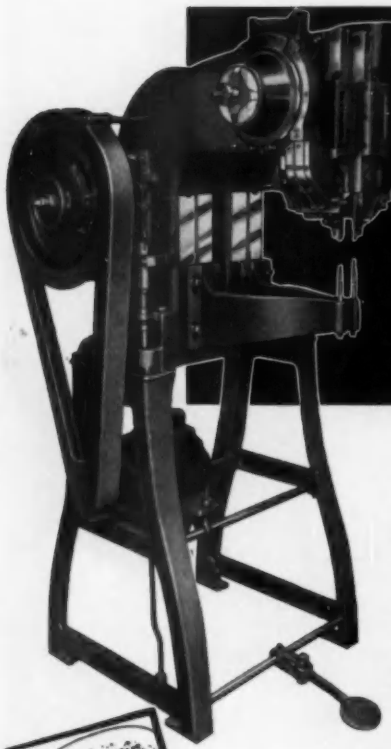
More Government Contract Awards

THIS latest list of Government prime contracts that have been awarded covers the period from Dec. 16 to Jan. 31, 1956. Items included in this list are for various types of automotive military equipment, including tanks, motorized gun carriages, trucks, airplanes, automotive components and spare parts, automotive maintenance equipment, etc.

ACF INDUSTRIES, INC., Erco Div., Hyattsville, Maryland
Trainers—$791,965
Flight simulator—$1,030,343

AEROQUIP CORP., Jackson, Michigan
Coupling—5 items—$27,736
Fitting end—13,493,200 ea.—$134,936

AIRCRAFT MARINE PRODUCTS, Harrisburg, Pa.
Electrical lead ground and electrical lead line connector subassemblies and fin retainer kits for rocket motors—$101,942



LOWER THE BOOM ON COSTS
SET RIVETS FAST
2 at a time with the
Chicago "214"

With every press on foot pedal Model 214 Chicago Double Rivet Setter automatically feeds, inserts and clinches *two* rivets. 14-inch throat accommodates large assemblies. Handles 9/64" diameter or smaller steel tubular rivets—lengths to 7/8". Quick Change Rotary Type Hoppers and Raceways permit a 5-minute changeover to rivets of different size. Adjustable anvils and riveting centers add to versatility. For help with fastening problem...send sample assembly (or a blue print) for free fastening analysis.

***FREE CATALOG** contains valuable engineering information and rivet specifications plus illustrated descriptions of 26 Chicago Automatic Rivet Setters.*

Chicago Rivet & MACHINE CO.
9612 West Jackson Boulevard, Bellwood (Chicago Suburb) Illinois
***Branch Factory:* Tyrone, Pa.**

ALLEN INDUSTRIAL PRODUCTS, INC., Battle Creek, Mich.
Cab- hard top—23 ea.—$27,168

AMERICAN BOSCH ARMA CORP., American Bosch Div., Springfield, Mass.
Parts—36,981—$96,085
Fire control system—111 ea.—$12,000,000

AMERICAN LAFRANCE CORP., Elmira, New York
Spare parts—275 ea.—$43,537

AMERICAN MOTORS CORP., Detroit, Michigan
Automobiles—99—$150,609

THE ANDERSON COMPANY, Gary, Ind.
Motor, windshield wiper—81,720 ea.—$155,268

AUTO-FRICTION CORP., Brookline, Mass.
Lining, brake—298,050 ft—$66,167

AVCO MANUFACTURING CORP., Lycoming Div., Stratford, Conn.
Aircraft engines—$10,694,648
Engines and tools—$4,170,450
Engines—$1,003,820

B. G. CORP., Ridgefield, New Jersey
Spark plugs—16,163 ea.—$449,001

BENDIX AVIATION CORP., Bendix Products Div., South Bend, Ind.
Carburetor and parts—Various—$1,164,150
Pump and nozzle assys.—Various—$218,245
Brake assemblies, wheel assemblies—9047—$6,335,994
Wheels, brakes, spare parts—$5,316,623
Additional facilities—$100,000
Brake assemblies—$338,783

BENDIX AVIATION CORP., Eclipse-Pioneer Div., Teterboro, N. J.
Indicator—604 ea.—$809,363

BENDIX AVIATION CORP., Red Bank Div., Eatontown, Pa.
Assemblies for aircraft—$143,456
Generators—$1,053,305
Motor generators—1186—$1,327,889

BENDIX AVIATION CORP., Scintilla Div., Sidney, New York
Parts for aircraft engines—Various—$143,198

BENDIX AVIATION CORP., Utica Div., Utica, New York
Starters—25 ea.—$142,561

BOEING AIRPLANE CO., Wichita Div., Wichita, Kansas
Airplanes—$55,000,000

BOEING AIRPLANE CO., Seattle, Wash.
Parts—1969 ea.—$192,324
B-52D airplanes—$247,955,920

BORG-WARNER CORP., Pesco Products Div., Bedford, Ohio
Services to overhaul pump assys.—Various—$68,013

CONTINENTAL AVIATION AND ENGINEERING CORP., Detroit, Mich.
Engines—$331,863
Repair engines—10—$36,340

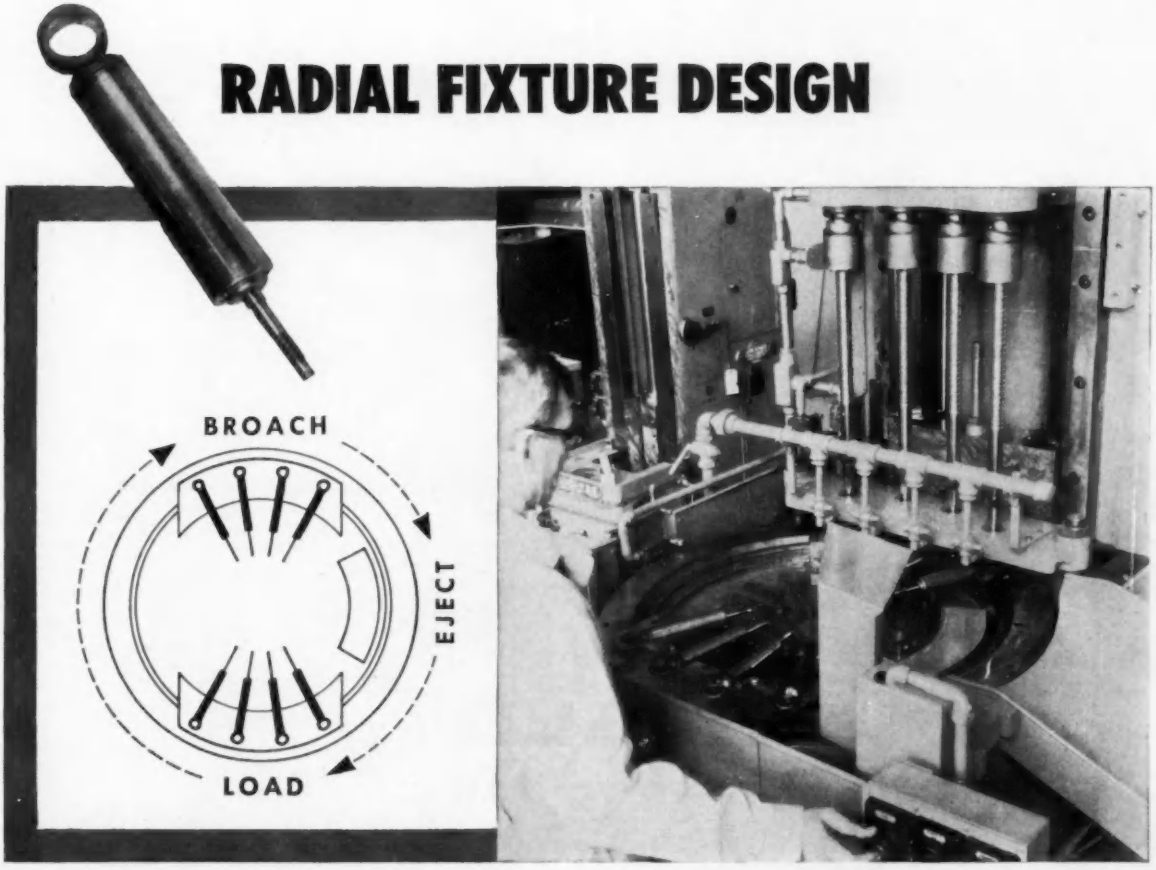
CONTINENTAL MOTORS CORP., Detroit, Mich.
Engine parts—245 ea.—$41,013

CONTINENTAL MOTORS CORP., Muskegon, Mich.
Engines—39 ea.—$127,482

CROWN COACH CORP., Los Angeles, Calif.
Buses—10 ea.—$237,355

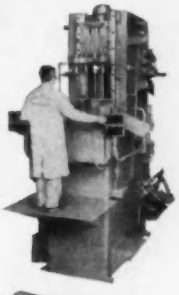
(Turn to page 158, please)

RADIAL FIXTURE DESIGN



contributes to HIGH OUTPUT BROACHING

the *American* way



While this American vertical pull-down broaching machine is broaching the inside diameter of four shock absorber yokes, the operator loads the opposite four radial stations of a rotating base fixture. At the end of the broaching stroke, the fixture indexes 90° and automatically ejects the parts down a chute. Fixture then rotates another 90° for loading while the second broaching cycle is begun.

Operation is push-button controlled — output over 1100 pieces per hour.

Unusual tooling to meet specialized production requirements is constantly being developed through creative engineering at American. Whether your broaching problem requires the best in automatic or automated control, or simply an economical adaptation of a standard machine, you will gain by referring your requirements to American. American has been making broaches, fixtures and broaching machines — all three — for over 35 years. To put this experience to work for you, send a blue print or sample part. An American recommendation will be furnished promptly.

Ask for Catalog No. 450

AMERICAN *American* BROACH & MACHINE CO.

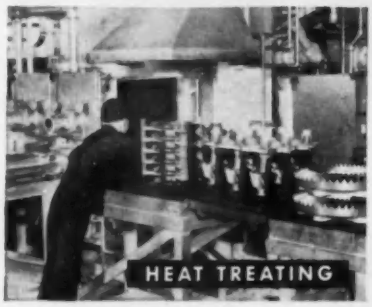
A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

SUNDSTRAND

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

"FAIRFIELD for FINE GEARS"



WHAT **FAIRFIELD**

Experience MEANS TO YOU

Experience is the "plus value" that goes into every Fairfield gear *at no extra cost.* It is your assurance of dependable gear performance combined with the utmost in production economy. By specializing exclusively in "Fine Gears Made to Order" for more than thirty-five years, Fairfield has become one of America's largest independent producers of these parts. This is why many makers of Construction Machinery . . . Agricultural Implements . . . Machine Tools . . . Material Handling Equipment . . . Trucks, Tractors, and Buses now regularly depend on Fairfield to meet their requirements.

Fairfield's facilities are unexcelled. Here, in a new and ultra-modern plant you will find a complete metallurgical department, batteries of the most modern machines, testing laboratories, latest heat treating equipment—all operated by skilled craftsmen working under expert engineering supervision. *For the Best in Gears, Specify Fairfield!*

FAIRFIELD
MANUFACTURING CO.

2303
S. Concord Rd.

For FINE GEARS

Lafayette,
Indiana

(*Continued from page* 156)

CURTISS-WRIGHT CORP., Propeller Div., Caldwell, New Jersey
Propeller parts—$135,045

CURTISS-WRIGHT CORP., Wright Aeronautical Div., Wood-Ridge, N. J.
Overhaul aircraft engines—600 ea.—$3,795,000
Modification of aircraft engines—1000—$1,550,000
Parts—50—$175,774

DART TRUCK COMPANY, Kansas City, Missouri
Snowplow carrier—$202,713

DOUGLAS AIRCRAFT CO., INC., Long Beach, Calif.
C-133A training unit—$940,000

ELECTRIC AUTO LITE, Toledo, Ohio
Starter—$214,642

FAIRBANKS, MORSE & CO., Chicago, Ill.
Diesel engine—35—$983,836

FAIRCHILD ENGINE AND AIRPLANE CORP., Fairchild Aircraft Div., Hagerstown, Maryland
Modification of aircraft—201 ea.—$2,460,640

FARGO MOTOR CORP., Washington, D. C.
Light trucks—16—$42,148

FORD MOTOR CO., Washington, D. C.
Automobiles—373—$498,931
Trucks—213—$302,642.98
Light trucks—118—$137,366
Truck tractor—19 ea.—$58,063

FORD MOTOR COMPANY, Dearborn, Mich.
Jet engines—$265,776,509
Implementation for production of aircraft engines—$6,000,000

FORD MOTOR CO., Ford Div., Livonia, Michigan
Bus—25 ea.—$109,271

GARDNER-DENVER CO., Quincy, Illinois
Repair parts—8685 ea.—$26,320

GAR WOOD INDUSTRIES, INC., Wayne, Mich.
Hook block, crane or crane-shovel—335 ea.—$38,970

GENERAL DYNAMICS CORP., Convair Div., San Diego, Calif.
Facilities—$2,126,560
Airplanes—$50,000,000

GENERAL ELECTRIC CO., West Lynn, Mass.
Tachometer generator—$220,036

GENERAL ELECTRIC COMPANY, Schenectady, New York
Crankcase assemblies—2845 ea.—$157,223

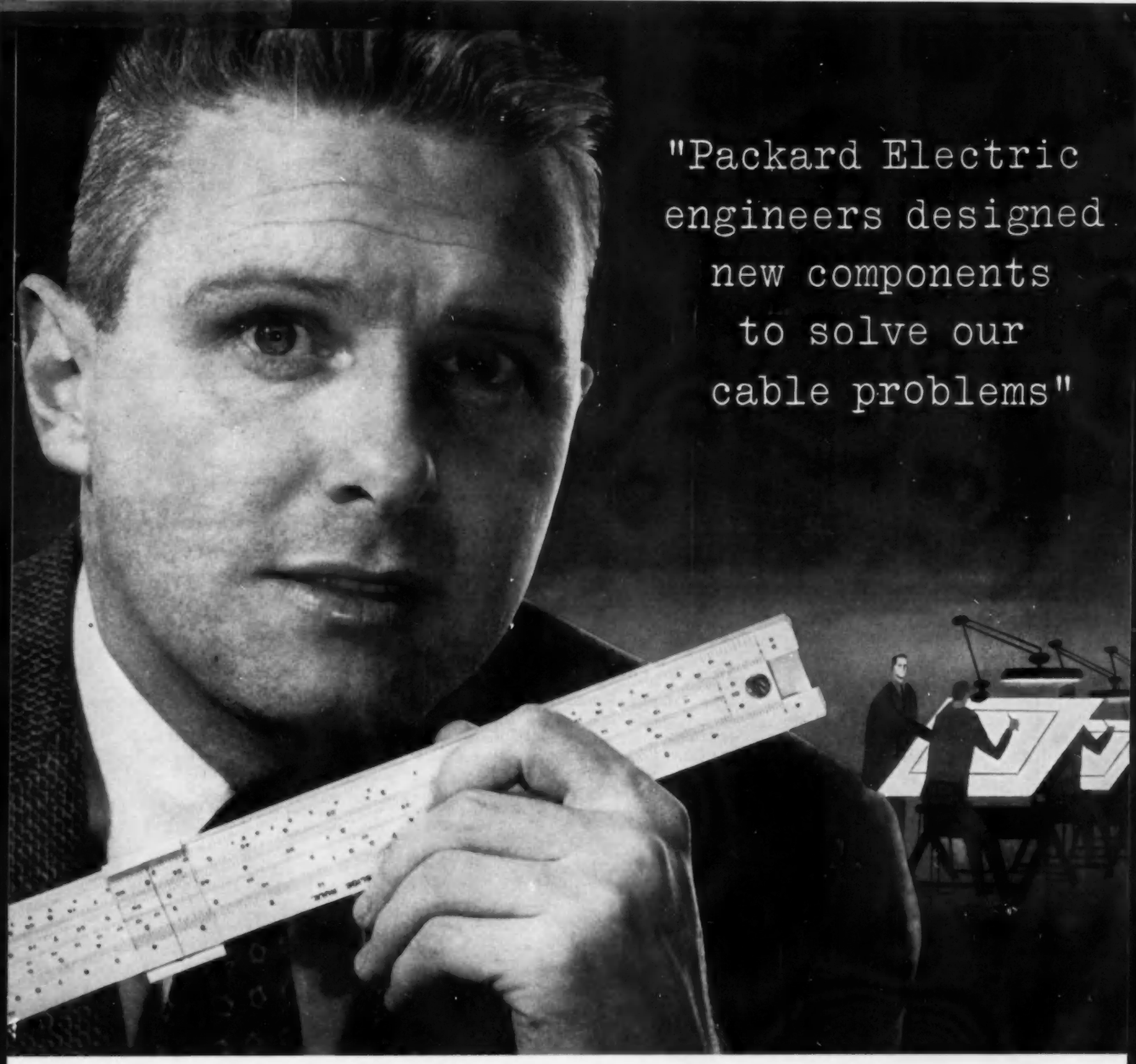
GENERAL ELECTRIC COMPANY, Erie, Pa.
Generator—479 ea.—$197,477

GENERAL MOTORS CORP., La Grange, Ill.
Parts—18,716 ea.—$109,691

GENERAL MOTORS CORP., AC Spark Plug Div., Flint, Mich.
Parts—4527 ea.—$33,953
Spark plugs—Various—$729,324
Motors—1430 ea.—$175,676
Gun sight—$1,148,350

GENERAL MOTORS CORP., Aeroproducts Div., Dayton, Ohio
Repair of propeller assemblies—$1,146,000

(*Turn to page* 162, *please*)



Sound engineering consultation—and a good product—have made Packard Cable first in sales.

Can our engineers help you?

TO LESSEN IGNITION INTERFERENCE on radio, TV and other communication devices, Packard Electric developed a new, high-tension cable built with non-metallic conductor. This new cable suppresses electrical oscillations throughout the length of the circuit instead of only at one point as was previously possible.

FOR CABLE SUBJECTED TO ABRASION, weathering and other deteriorating elements, Packard Electric developed a new type plastic exterior insulation which not only *works* better but *looks* better on truck, tractor, boat and other engines.

PACKARD ENGINEERING WORKS FOR YOU in many ways. Whether you need a new cable component or a complex wiring harness, ready for snap-in installation—it will pay you to discuss the problem with us. Because we know the business *from the inside out* . . . more Packard Electric cable is used as original automotive equipment than all other makes combined.

GM GENERAL MOTORS Packard

REG. U.S. PAT. OFF.

Packard Electric Division
General Motors, Warren, Ohio

Offices in Detroit, Chicago, and Oakland, California • Aviation, Automotive and Appliance Wiring

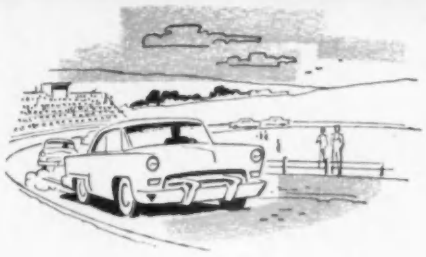
WE WERE

in every recent major automotive

Spicer Products were there... helping

Mexican Road Race

1954—Lincoln, 1st and 2nd places.
1953—Lincoln, 1st, 2nd, 3rd, 4th, 7th, 8th and 9th places.
1952—Lincoln, 1st, 2nd, 3rd and 4th places.



Stock Car Races

1955—30 races won by Chevrolet, 5 races won by Ford Thunderbird.
1954—24 races won by Hudson Hornet.
1953—47 races won by Hudson Hornet.

Mobilgas Economy Run

1955 Sweepstakes Winner—Studebaker.
1954 Sweepstakes Winner—Studebaker.
1953 Sweepstakes Winner—Ford 6.
1952 Sweepstakes Winner—Mercury.

Since 1904 . . . when Clarence W. Spicer adapted the first universal joint to automotive needs . . . Spicer Products have helped set many new performance records, and have helped establish new standards of motor vehicle value in America's greatest industry.

In each new model year, original Spicer designs or cooperative developments serve to increase power transmission efficiency, through engineering excellence and quality of manufacture.

No matter what type of automotive vehicle you make . . . no matter what type of power transmission design you need . . . Spicer engineers and Dana resources can serve you well.

Spicer

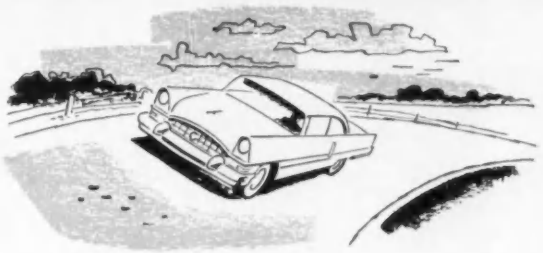
DANA CORPORATION Toledo 1, Ohio

THERE !

endurance, speed and economy test... to establish new world's records!

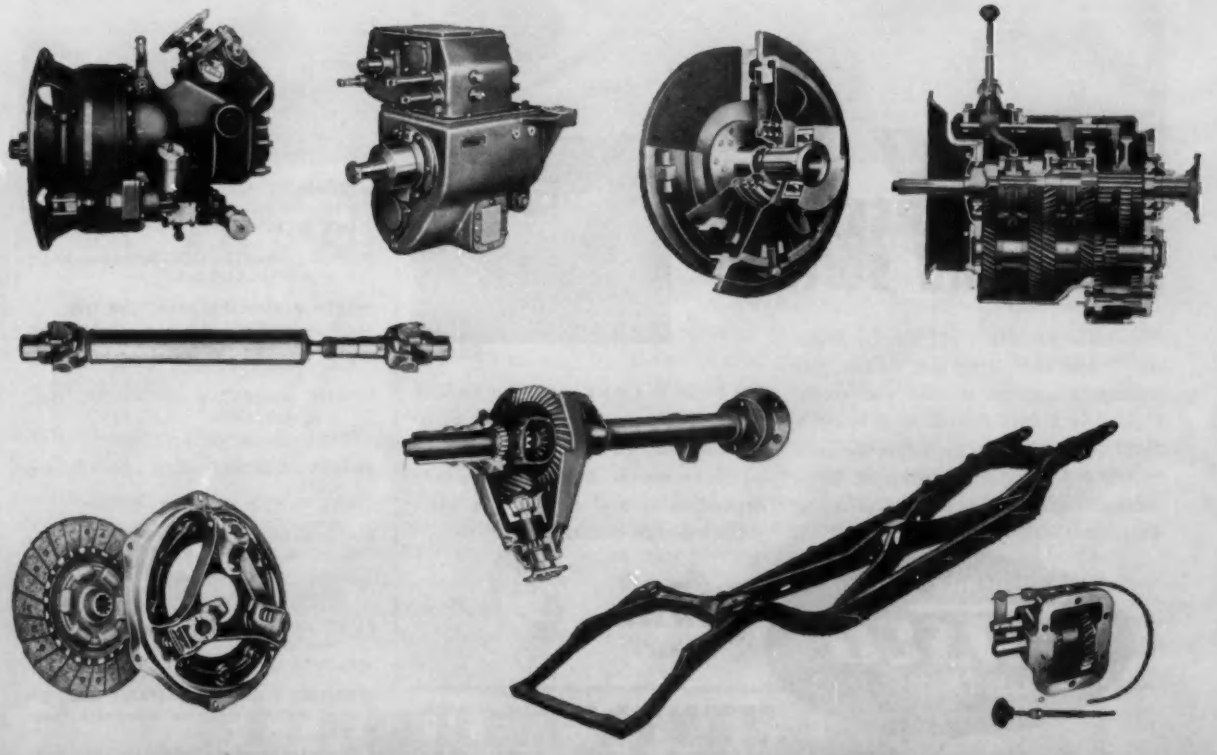
Pike's Peak Climb

New world record set September 9, 1955, by Zora Arkus-Duntov driving a 1956 Chevrolet. Time 17 minutes, 24.05 seconds.



Durability Run

25,000-Mile Durability Run in 238.77 hours total elapsed time for an average speed of 104.7 MPH established by a Packard Patrician.



SPICER PRODUCTS: TRANSMISSIONS • UNIVERSAL JOINTS • PROPELLER SHAFTS • AXLES • TORQUE CONVERTERS • GEAR BOXES • POWER TAKE-OFFS
POWER TAKE-OFF JOINTS • RAIL CAR DRIVES • RAILWAY GENERATOR DRIVES • STAMPINGS • SPICER and AUBURN CLUTCHES • PARISH FRAMES • SPICER FRAMES

(*Continued from page* 158)

GENERAL MOTORS CORP., Allison Div., Indianapolis, Indiana
Turbo-jet engines—$30,442,500

GENERAL MOTORS CORP., Cadillac Motor Car Div., Cleveland, Ohio
Gun, twin, 40mm, spare parts and equipment—$23,507,320

GENERAL MOTORS CORP., Chevrolet Motor Div., Detroit, Mich.
Automobiles—540—$665,347
Light trucks—512—$656,647
Trucks—79—$67,979

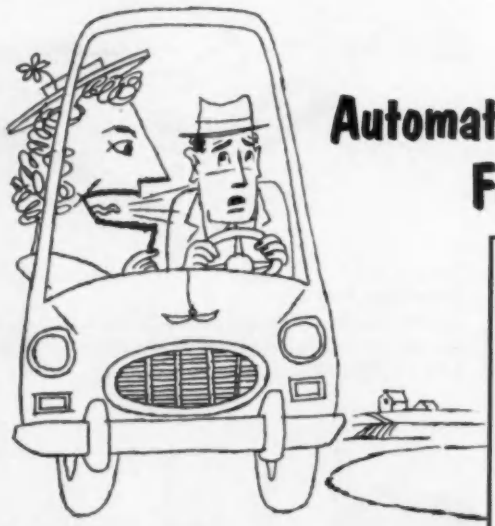
GENERAL MOTORS CORP., Cleveland Diesel Engine Div., Cleveland, Ohio
Repair parts—245 ea.—$51,741
Parts—35,794—$424,499

GENERAL MOTORS CORP., Delco Appliance Div., Rochester, New York
Motor assembly—1051 ea.—$43,584

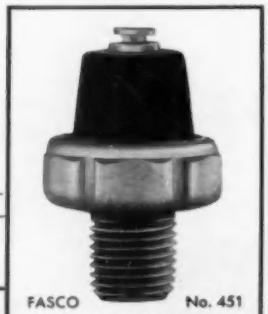
GENERAL MOTORS CORP., Detroit Diesel Engine Div., Detroit, Mich.
Parts—229,252 ea.—$275,263
Engines—$113,467

GENERAL MOTORS CORP., GMC Truck & Coach Div., Detroit, Mich.
Parts—327,728 ea.—$139,861

GENERAL MOTORS CORP., GMC Truck & Coach Div., Pontiac, Mich.
Parts—7251—$108,945
Truck, tractor—7 ea.—$62,172
Spare parts—167,896 ea.—$245,001



Automatic Reminder For Motorists



FASCO No. 451
Actual Size

FASCO
LOW OIL PRESSURE INDICATING SWITCH

The NEW FASCO "451" may be small; but . . . to the car owner, its essential protection against trouble and costly repairs is a BIG factor. And being a FASCO product, its unfailing dependability can be taken for granted. Sales-minded engineers are first to recognize its importance.

ON PUBLIC CARRIERS, the FASCO "451" also meets the need for a warning indicator of low pressure in the air-brake system. Remember . . . where dependability and economy in automotive design count, IT PAYS TO . . .

AUTOMOTIVE DIVISION
FASCO
INDUSTRIES, INC.

Consult FASCO First!

ROCHESTER 2, NEW YORK

DETROIT OFFICE—12737 PURITAN—PHONE: UN 17476

THE GENERAL TIRE AND RUBBER CO., Akron, Ohio
Nose wheel assemblies—1419 ea.—$149,-341
Wheel—$82,093
Wheel assemblies—$85,628

THE B. F. GOODRICH CO., Dayton, Ohio
Wheel assemblies—$159,621

GOODYEAR TIRE & RUBBER CO., INC., Akron, Ohio
Brake assys. for F4D-1 aircraft—253 ea.—$59,857
Wheel and brake assemblies—$726,605
Wheel assemblies—$498,576

HALL-SCOTT MOTORS CO., Berkeley, Calif.
Gasoline engine—40 ea.—$475,558

HOLLEY CARBURETOR CO., Detroit, Mich.
Services and parts to overhaul fuel controls—Various—$298,461

HOLLEY CARBURETOR CO., Van Dyke, Michigan
Parts for J57-P7 engines—$107,062

HYSTER COMPANY, Portland, Oregon
Truck, forklift—20 ea.—$122,000

INTERNATIONAL HARVESTER CO., Washington, D. C.
Trucks—23—$61,910

INTERNATIONAL HARVESTER EXPORT CO., Chicago, Ill.
Trucks—3 ea.—$12,080

JACK & HEINTZ, INC., Cleveland, Ohio
Starters—171 ea.—$39,378
Generators—$368,573

JACKSON & CHURCH CO., Saginaw, Michigan
Guide, launching engine piston—160 ea.—$36,952

LELAND ELECTRIC CO., Div. of American Machine and Foundry Co., Dayton, Ohio
Motor-generators—1076—$1,566,835

LOCKHEED AIRCRAFT CORP., Burbank, Calif.
Aircraft—$43,489,701

McDONNELL AIRCRAFT CORP., St. Louis, Missouri
Parts for F2H aircraft—$82,678

GLENN L. MARTIN CO., Baltimore, Md.
Aircraft kits—$388,248

NORTH AMERICAN AVIATION, INC., Los Angeles, Calif.
Airplanes—$4,000,000
Aircraft—$25,000,000

NORTH AMERICAN AVIATION, INC., Columbus, Ohio
Parts for AJ aircraft—Various—$89,978

PARKER AIRCRAFT CO., Los Angeles, Calif.
Parts for FJ-2, 3 aircraft—$32,814

PIASECKI HELICOPTER CORP., Morton, Pa.
H-21C helicopters—$10,000,000
Repair transmission and rotor hub assemblies—1437 ea.—$439,770

PUROLATOR PRODUCTS, INC., Rahway, New Jersey
Parts—8000 ea.—$52,160

STERLING ENGINE COMPANY INC., Div. of Sterling Precision Instrument Corp., Menominee, Mich.
Parts—8813 ea.—$79,148

(*Turn to page* 164, *please*)

He's chalking one up for quality

One thing is certain in making hot-rolled carbon bars — the better the billet the better the bar. That is why we are careful to supply good, sound, *properly prepared* billets for rolling in our bar mills.

But there's a lot behind that phrase, "properly prepared." For example, a typical processing of high-quality bars requires that the bloom be *skinned* — hot-scarfed over its entire surface — before being rolled down to a billet. Next, these billets get a thorough going-over by an eagle-eyed inspector like the man shown above, at work in our Lackawanna plant.

He checks billet ends for signs of "pipe"; thoroughly goes over all other surfaces for defects such as scabs, slivers or seams. When he spots an imperfection, he chalk-marks the area for hand-scarfing by the men shown in the background. After scarfing, the inspector carefully re-checks the billet. When that billet gets his final OK, you can be sure its surface condition is right for rolling in our bar mills.

These inspectors and the scarfers who work with them — as well as the Bethlehem people in the raw-materials stockyards, around the furnaces and in the mills — are good, reliable men. They're proud of the excellent equipment they work with, and they're proud of the products they make . . . quality products like Bethlehem hot-rolled carbon bars.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

OLSEN

Makes Balancing History

with a complete line of

Elec⊕dyne

Static-Dynamic Balancing Machines

- **Instantaneous Unbalance Indication** The exclusive Olsen Elec⊕dyne takes the guesswork out of balancing . . . instantly indicates the amount and angle of unbalance on two large meters. Even minute quantities of unbalance are quickly pinpointed by this highly sensitive electronic indicating system.
- **Ease of Operation** Operator merely inserts the part and starts the machine. In a matter of seconds he knows the angle and amount of indication for both planes of correction.
- **Positive Plane Separation** The pivoted cradle, an Olsen exclusive, provides positive plane separation . . . only the unbalance in the selected plane of correction is measured by the Elec⊕dyne.
- **Simplicity of Calibration** Both the Angle and Amount Meters can be calibrated quickly with the aid of a screw driver. Expensive "masters," and trial and error methods to obtain a "zero" unbalance are eliminated.
- **Production Line Balancing** is a reality with the Olsen Elec⊕dyne—your best investment for rapid, accurate and low cost balancing.

Bulletin 49 contains details on the complete line of Olsen Elec⊕dyne Balancing Machines. Write for your copy.

TINIUS ⊕ OLSEN

Testing & Balancing Machines

TINIUS OLSEN TESTING MACHINE CO.

2090 Easton Road · Willow Grove, Pa.

(*Continued from page* 162)

STUDEBAKER-PACKARD CORP., Detroit, Michigan
Crankcase assemblies—14 ea.—$66,253

TITEFLEX, INC., Newark, New Jersey
Lead for ignition harness assys.—3290 ea. —$68,070

VICKERS, INC., Tulsa Winch Div., Tulsa, Oklahoma
Winch assy.—$51,660

WELDED CONSTRUCTION ENGINEERING CO., Cleveland, Ohio
Trailer, stake—128 ea.—$39,910

WILLY MOTORS, INC., Toledo, Ohio
Light trucks—113—$232,623
Trucks—51—$104,676
Station wagons—55 ea.—$103,481

THE YALE & TOWNE MFG. CORP., Phila., Pa.
Truck, forklift—112—$412,370

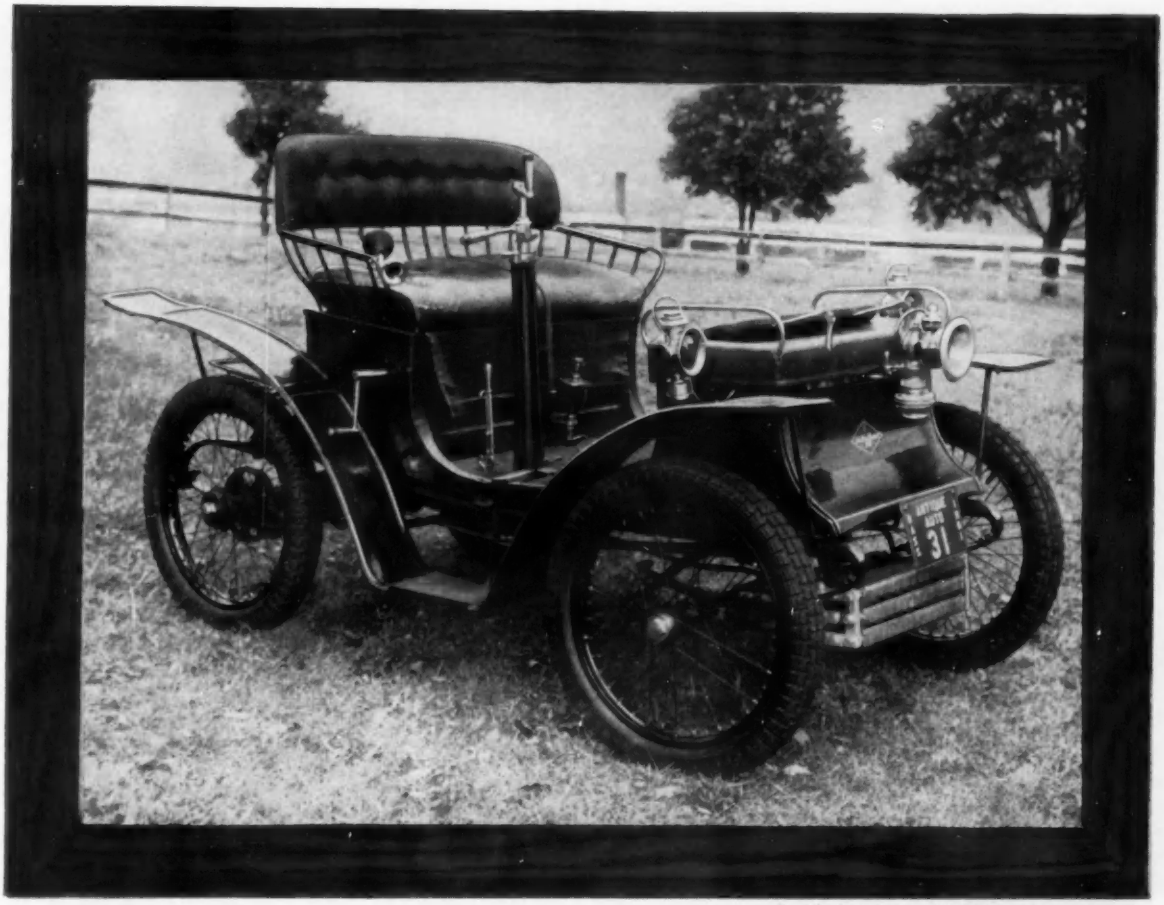
BOOKS . . .

COMBUSTION RESEARCHES AND REVIEWS 1955, *published by Butterworths Publications Ltd., London, England, available from Interscience Publishers, Inc., 250 Fifth Ave., New York 1, N. Y. Price, $5.00.* Sponsored by the Advisory Group for Aeronautical Research and Development of NATO, this book contains invited papers presented at combustion panel meetings. They deal with combustion phenomena in aircraft as a function of many sciences, and not solely a chemical, aerodynamic or thermodynamic effect. Discussed in detail are the combustion of fuel sprays, carbon formation, diffusion flames, flame stabilization, and spray formation and combustion.

POWDER METALLURGY, *published by Organization for European Economic Co-Operation, 2002 P Street, N.W., Washington, D. C. Price, $3.00.* This book is a result of the work of a technical assistance mission of the European Productivity Agency which recently visited 43 factories, universities and research establishments in the U. S. Covered are manufacturing methods, assembly, use of conveyors, compressed air and electro-magnetic applications, and plant equipment required. The report should be of interest to those concerned with making or using sintered parts.

FIFTH SYMPOSIUM (International) ON COMBUSTION, *published for The Combustion Institute by Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. Price, $15.00.* Here in bound form are 101 outstanding papers presented at the Fifth International Combustion Symposium held at the University of Pittsburgh in 1954. The work of 182 contributors from any parts of the world, this momentous book offers a complete, authoritative and up-to-date body of knowledge assembled on the combustion problems involved in the efficient operation of all types of engines.

DIESEL OPERATOR'S GUIDE, *by C. Morgan Jones, published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. Price, $6.50.* This book is a practical guide for Diesel engine users to quick and efficient maintenance and operation. Engines used in automotive, stationary, and marine installations are covered. The book tells how to recognize engine trouble symptoms, how to diagnose their causes, and how to remedy defects.



Send for Free Print—1900 De Dion-Bouton Motorette.
This print from the file of P. S. de Beaumont, not for commercial use.

The De Dion-Bouton is remembered today for the De Dion axle, a frame that contained the differential, which more recently many racing and sports car models have adopted. This model also employed a one-cylinder engine mounted in the rear with automatic intake valve. This is one of a series of antique automobile prints that will appear in future Morse advertisements. Write for your free copy, suitable for framing, to: MorseChainCompany,Ithaca,NewYork.

Why Morse Timing Chains are original equipment on 18 out of 22 automobiles

Morse Timing Chain Drives are now specified as original equipment on eighteen out of twenty-two makes of automobiles. This is true for several reasons:

(1) Morse Timing Chain Drives assure car, bus, and truck manufacturers of long, trouble-free service life—eliminate maintenance difficulties. (2) Morse Timing Chain Drives offer safe, quiet, and smooth operation, even when camshafts and crankshafts are not exactly parallel. (3) Speedy delivery of a complete line of timing chain drives helps to meet production schedules. (4) Morse offers expert engineering service to assist in solving automotive timing chain problems of design, development, and application.

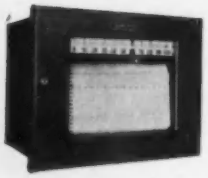
Check with Morse on your timing chain problems. Find out, too, how well other Morse Power Transmission Products can answer your needs in product design and application. MORSE CHAIN COMPANY, ITHACA, NEW YORK.

MORSE BW **CHAINS, CLUTCHES, AND COUPLINGS**

Whatever your furnace needs for control—

There's good reason why more heat-treating furnaces everywhere are controlled by Brown instruments. First, of course, is performance . . . sensitive, precise control that meets the most exacting requirements of modern heat-treating techniques. And equally important is versatility. In this varied line of instrumentation you'll find just about everything a furnace could possibly need in the way of control.

Choose *ElectroniK* Strip Chart Controllers for detailed, long-term records . . . and a selection of control forms including electric systems of the contact, position-proportioning (*Electr-O-Line*) and time-proportioning (*Electr-O-Pulse*) types; and pneumatic control from two-position to full proportional-plus-reset-plus-rate action.



Choose *ElectroniK* Circular Chart Controllers for ease of scale reading . . . convenient daily charts; in a full range of electric and pneumatic control forms.

Note: the basic components of all *ElectroniK* models are interchangeable . . . to simplify and speed up service.

Choose *ElectroniK* Circular Scale Controllers where you want readability and control check at extreme distance . . . without need for a record. Supplied with all contact and proportional types of electric control.

Note: all *ElectroniK* models are available in both Standard and Precision Series.

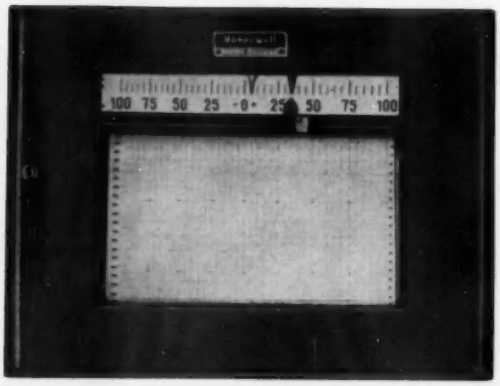
Choose *Pyr-O-Vane* Controllers where you don't need a record but do need precise vane type snap action electric control by a millivoltmeter instrument... also available with pulse-type time proportioning action, in both vertical and horizontal models.

Choose the *Protect-O-Vane* Safety Cut-Off for simple, dependable excess temperature protection ... can be used with any temperature control to prevent furnace shut downs and loss of production.

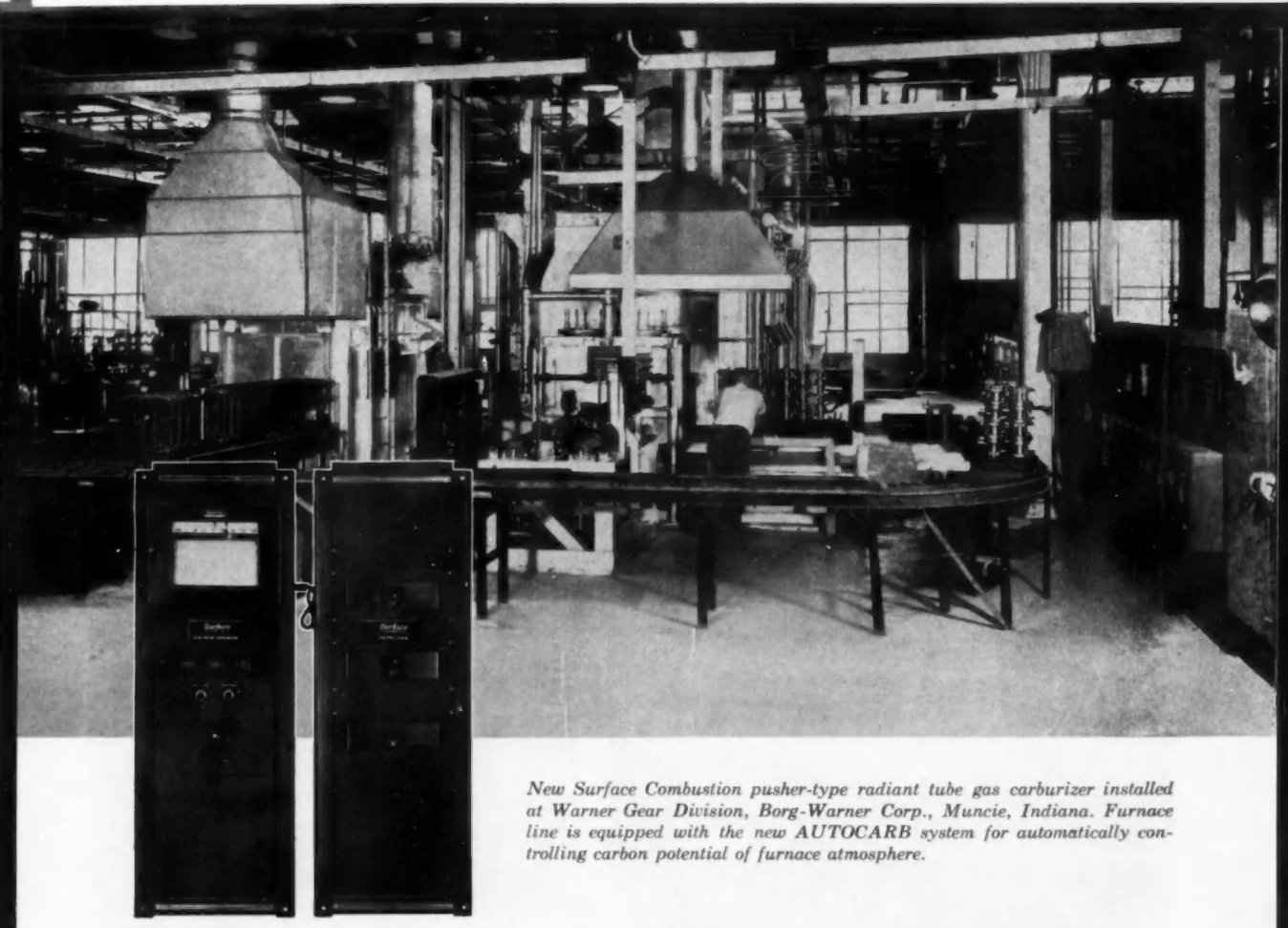
• • •

And . . . for all your pyrometer supplies, investigate the convenience and economy advantages of the HSM Plan.

Surface Combustion's new AUTOCARB System features



***ElectroniK** "Multi-Check" Dew Point Recorder-Controller. Six-station strip chart instrument continuously and successively determines carbon potential in heating chamber of batch furnace or in each zone of continuous furnace. Controller accurately regulates mixture of "carrier" and "enriching" gas introduced into furnace atmosphere.*



New Surface Combustion pusher-type radiant tube gas carburizer installed at Warner Gear Division, Borg-Warner Corp., Muncie, Indiana. Furnace line is equipped with the new AUTOCARB system for automatically controlling carbon potential of furnace atmosphere.

ElectroniK Dew Point Controller

The new AUTOCARB system automatically regulates the carbon potential of the atmosphere in batch furnaces or continuous furnaces by measuring its dew point at regular intervals. By additions of air or enriching hydrocarbons, the AUTOCARB system corrects the mixture to the desired carbon potential. After an initial setting, operation is completely automatic . . . eliminating the possibility of "human error."

Ideal for such processes as case carburizing, homogeneous carburizing, carbon restoration, and clean hardening, the system automatically maintains constant dew point. Advantages are seen in higher uniformity, piece to piece; automatic compensation, for varying carbon demand by work; and in holding tighter specifications.

To achieve highest precision, Surface Combustion Corporation specified a six-point *ElectroniK* Dew Point Controller as the heart of the apparatus. Each point can measure carbon potential in a different zone of a continuous furnace . . . or the same zone can be checked repeatedly. The instrument can be set to control at a particular dew point, which, in turn, provides the exact carbon potential required in each zone.

Here is an outstanding example of the way the industry-proved *ElectroniK* controller contributes its speed, accuracy, and sensitivity to the march of progress in the heat treating industry. Your nearby Honeywell sales engineer will be glad to discuss the many ways you can use *ElectroniK* instruments...and profit. Give him a call . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.

● **REFERENCE DATA:**
Write for new Catalog 55-1, "Furnace and Oven Controls."

MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS
First in Controls

MEN *in the* NEWS

(*Continued from page* 41)

Progressive Welder Sales Co.—**William T. Wilbur** is now chief application engineer.

Ford Motor Co., Special Products Div.—**Robert F. G. Copeland** has been appointed assistant general sales manager for advertising, sales promotion, and training.

Kaiser Aluminum & Chemical Corp.—**George H. Gough** has been appointed assistant product manager for forgings.

Solar Aircraft Co.—**Frederick A. Schneller** has been named purchasing agent.

Raybestos-Manhattan, Inc., Packing Div.—**John McKinlay** has been made assistant sales manager.

Pittsburgh Screw and Bolt Corp.—**E. Mark Nease** has been made director of purchases.

AC Spark Plug Div., General Motors Corp. —Willis J. Oldfield is now sales promotion manager.

Alemite and Instrument Div., Stewart-Warner Corp. — William A. Brown, Jr., has been appointed general manager.

B. F. Goodrich Co.—**William H. Campbell** has been named manager of the Truck Tire Sales Dept.

Ajax Electric Co. — **George W. Dashnau** has been appointed advertising manager.

Reynolds Metals Co. — **Jules F. Saut** has been made manager of sales to the automotive industry.

Greer Hydraulics, Inc.—**John Farley** is now director of public relations.

Fansteel Metallurgical Corp. — **Stuart B. Miller** has been made comptroller, and **George E. Powell** has been chosen purchasing agent.

Joseph T. Ryerson & Son, Inc.—**Scott Vrooman** is now assistant manager of sales for the Chicago plant.

Lincoln Div., Ford Motor Co.—**Jackson C. Turnacliff** has been named manager of the Sales Promotion and Training Dept.

Kropp Forge Co.—**A. F. Tydeman** has been named director of purchasing.

Airtex Products, Inc.—**Ben Sadoff** has been elected president.

Cleveland Cap Screw Co.—**Henry G. Dacey** was made general sales manager, and **Thomas A. Fribley** was named assistant general sales manager.

Firestone Tire & Rubber Co. — **Byron H. Larabee** was elected assistant secretary, and **Elden H. Eaton** was elected assistant treasurer.

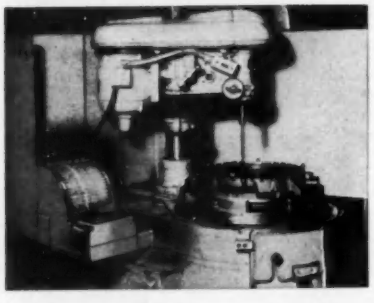
Bound Brook Oil-Less Bearing Co. —**Harold O. Johnson** was named chairman of the board and treasurer; **William R. Toeplitz**, president; and **Samuel S. Connor**, vice-president and secretary.

(*Turn to page* 172, *please*)

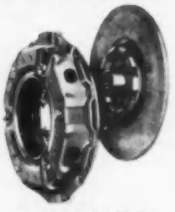
ROCKFORD

MEMO—clutch must have accurate balance

All ROCKFORD clutch plates not only are carefully checked for accuracy of dimensions, but are inspected on an electronic balancing machine. Uniform operation, minimum wear,



SPRING



LOADED

less frequent adjustment and long life qualities of ROCKFORD CLUTCHES thus are protected during production.

Let our engineers show you how ROCKFORD quality safeguards insure low maintenance for ROCKFORD clutch equipped machines.

ROCKFORD
Clutch Division
BORG-WARNER
315 Catherine St., Rockford, Ill.

CLUTCHES

Adjustable to either concave or convex shape, Heller flexible VIXEN® files are particularly adapted to any type of work where an accurate curved surface must be achieved. The deep gullets and wide pitch designed into the milled curved-teeth of VIXEN files prevent clogging or loading . . . even on soft metals and fibrous materials. The special undercut of the VIXEN's teeth takes a deep bite . . . and leaves a smooth, scratch-free surface. Available in the rigid tang, as well as the flexible type. No other milled curved-tooth file equals the original VIXEN.

HELLER VIXEN® MILLED CURVED TOOTH FILE

IDENTIFY VIXEN FLEXIBLE BY THE WHITE ENVELOPE . . . VIXEN RIGID BY THE WHITE TANG

Try These Other Famous HELLER BRAND FILES:

HELLER American-Swiss® SWISS PATTERN

NUCUT® AMERICAN PATTERN

HELLER TOOL CO.

Subsidiary of Simonds Saw and Steel Co.

NEWCOMERSTOWN, OHIO

Branches: New York, Detroit, Chicago, Los Angeles

HELLER TOOL CO. SINCE 1836

YOUR HELLER DISTRIBUTOR CAN SUPPLY *ALL* YOUR FILE NEEDS

Before buffing. Note the high quality surfaces on these raw Doehler-Jarvis die castings for Black and Decker's new ¼" Utility Drill.

After buffing. Front photo shows mirror finish attained.

How Doehler-Jarvis helps Black & Decker's "do-it-yourself" family make merchandising history

Doehler-Jarvis die casts power tool that buff to a mirror finish in

Millions of "do-it-yourselfers" got their start with a Black and Decker power tool.

What makes people reach for a B & D tool? ...not only men, but women, too?

B & D says, "Good looks, good design, good quality, good price!"

Doehler-Jarvis die castings help Black and Decker achieve all four.

That eye-catching finish, for example. It's not chrome. It's "as-cast" aluminum, buffed to mirror brightness in *one* operation. No pre-grinding. No roughening. No grease wheeling. Not even a final buffing after assembly.

What's the secret of this quality finish?

Some people just point to a raw Doehler-Jarvis casting. "Look at that 'Hardware' surface," they say. "Not a dent. Not a blemish. Not a flow mark. It's even hard to tell where parting line and flash have been removed."

And certainly Doehler-Jarvis does give Black and Decker a casting they can work with. But you should see Black and Decker's buffing set-up. It's fully automatic, fully controlled. Air conditioned, without a speck of dust. Few concerns go as far as B & D to insure high quality buffing.

Reality lies somewhere in between

Achievements like this are to be expected

housings one operation

when a closely knit relationship develops between engineers of two companies over many years of product development.

Hardly a Black and Decker tool has not benefited in one way or another from this fruitful relationship. From it has come lighter weight, higher precision, increased strength, simplified and lower cost production, many performance improvements. And Black and Decker takes full advantage of the flexibility of die castings to provide extra sales features and aid economy.

Maybe this is the time for you to do as companies like Black and Decker, Singer, AMF, Underwood, York, and many another have done...time to initiate a profitable business and engineering relationship based on the use of Doehler-Jarvis die castings.

Doehler-Jarvis Division

of

National Lead Company

General Offices: Toledo 1, Ohio

For better, safer, more economical parts packaging—

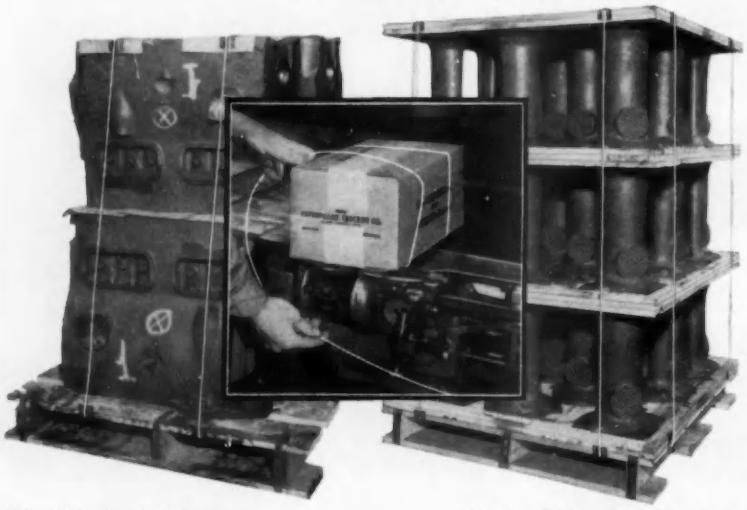
USS GERRARD STEEL STRAPPING

USS GERRARD Strapping, Round or Flat, is available in a wide range of sizes—tailored for every tying application from small parts packaging to palletizing, unitizing, crating, and carloading. Here's how it gives you a better package at lower cost:

- USS GERRARD Round Strapping costs about *40% less* than any other form of metal reinforcement.
- USS GERRARD hand-operated and semi-automatic machines tie quickly, efficiently.
- USS GERRARD-strapped bundles and pallets can be handled with greater safety in less time. Accidents averted, man hours saved.
- Steel-strapped bundles require only one inventory. No loose pieces. Pilferage eliminated . . . damage prevented.
- Single-source buying of both Round and Flat Steel Strapping reduces freight charges and paper work.

Bring your packaging and tying problems to USS GERRARD. Our engineers are here to help you solve them—at no cost to you.

GERRARD STEEL STRAPPING DIVISION, UNITED STATES STEEL CORPORATION
General Offices: Chicago, Ill.



Diesel Engine Crankcases — Tractor Differential Housings — Small Tractor Parts

NEW CATALOG—HOT OFF THE PRESS! 36 pages of photographs, descriptions, facts and figures on all USS GERRARD Steel Strapping and associated equipment.

SEND FOR THIS NEW BOOKLET NOW

Gerrard Steel Strapping
4725 South Richmond Street, Chicago 32, Illinois
Please send me, free of charge, the new 36-page GERRARD Blue Book of Packaging.

Name .....
Company .....
Address .....
City ..... State.....

USS GERRARD STEEL STRAPPING

Round and Flat

UNITED STATES STEEL

MEN *in the* NEWS

(*Continued from page* 168)

Plymouth-Div., Chrysler Corp. — Lyle W. Blanchard has been chosen manager of industrial engineering.

Westinghouse Electric Corp., Aviation Gas Turbine Div.—**W. A. Mechesney** is now manager of contract administration.

Chrysler Div., Chrysler Corp.—**Clifford C. Lockwood** was appointed administrative manager for advertising and merchandising.

Ford Div., Ford Motor Co.—**Charles E. Bosworth** has been appointed general purchasing agent.

Pesco Products Div., Borg-Warner Corp.—**Robert G. Hess** was named executive vice-president.

Buick-Oldsmobile-Pontiac Assembly Div., General Motors Corp.—**Howard F. Settle** has been named manager of the Wilmington, Del., plant.

Willys-Overland Export Corp. —**Roger Wolfers** has been appointed vice-president in charge of sales.

Reliance Electric & Engineering Co.—**Edward E. Helm** was named vice-president and general manager; **Charles R. Sutherland,** controller; **Richard A. Geuder,** general sales manager; and **Earl C. Barnes,** assistant chief engineer.

Perfect Circle Corp.—**Blair T. Martin** has been made assistant sales manager.

Nash Motors Div., American Motors Corp.—**M. A. Saunders** has been promoted to assistant sales manager.

AC Spark Plug Div., General Motors Corp.—**Donald O. Rathbun** has become supervisor of employment.

Thompson Products, Inc., Light Metals Div.—**Clyde C. Logue** was named manager.

Nash Motors Div., American Motors Corp.—**J. B. Fountain** has been named manager of the new Midwestern Div.

Bell Aircraft Corp.—**Terrence M. Nolan** has been made manager of product planning.

Bakelite Co.—**John D. Bendito** was appointed general sales manager.

CHRYSLER CORPORATION

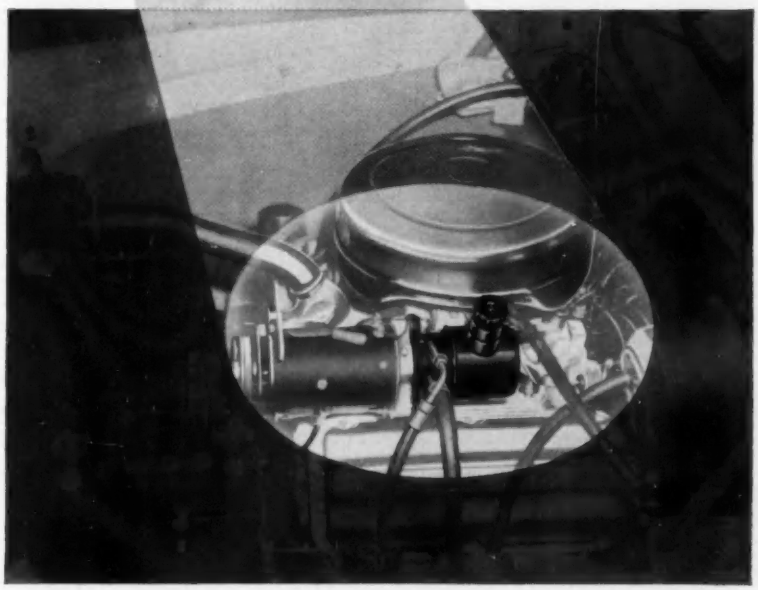
also Spotlights VICKERS PUMPS FOR POWER STEERING

Automotive industry recognition of Vickers outstanding achievements in hydraulic pumps for power steering grows continually. The new De Soto and Dodge are among the 1956 automobiles using a Vickers Vane Type Pump for this purpose. The new Model VT24 is extremely compact and light in weight . . . it also has the time-proved Vickers Pump advantages of exceptional dependability, long life, high efficiency and quiet operation.

VICKERS INCORPORATED

DIVISION OF SPERRY RAND CORPORATION

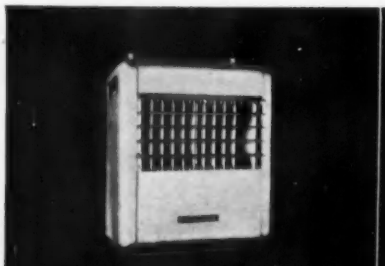
1428 OAKMAN BLVD. • DETROIT 32, MICH.



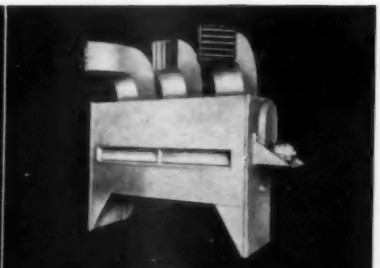
MORE VICKERS VANE TYPE PUMPS than all other makes combined are used for HYDRAULIC POWER STEERING

7391

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

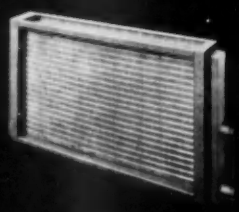


SPEEDHEATERS... Gas, steam and hot water types. Ideal for uniform space heating with rapid air circulation.



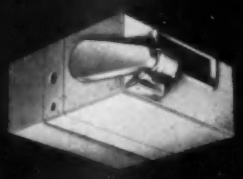
INDUSTRIAL HEATERS... The steam unit heater for industrial plants, warehouses, garages... floor, wall, and ceiling mounting ... adjustable nozzle outlets.

SILENTVANE FANS ... Non-overloading horsepower characteristics with stable, quiet operation.



STEAM HEATING COILS ... Standard and double tube non-ferrous ... also heavy duty wrought iron.

VENT SETS ... Direct-connected or V-belt driven ... compact for outdoor or indoor installation.



AIR HANDLING UNITS ... Contain all components necessary for "package" heating, ventilating and air conditioning.

*No. 1 of a Series

Put Air to Work Economically for:

***1. HEATING AND VENTILATING**
2. Fume, vapor and dust exhaust
3. Make-up air for balanced ventilation
4. Cooling and dehumidifying
5. Electronic Air Cleaning
6. Mechanical Draft for Steam Boilers

For complete application service, call your Consulting Engineer or your nearest Sturtevant Division Sales Engineer... or write Westinghouse Electric Corporation, Sturtevant Division, Dept. 5 B, Hyde Park, Boston 36, Mass.

WESTINGHOUSE AIR HANDLING

YOU CAN BE SURE... IF IT'S Westinghouse

J-80456

AI TABLOID

(*Continued from page 37*)

Boeing Airplane Co. has divided functions of its present Seattle aircraft manufacturing operations between a new Transport Div. and a new Seattle Div. The former will be responsible for the KC-135 and KC-97 tanker-transports and the 707 commercial jet transports. The new Seattle Div. will be responsible for the B-52 eight-jet bomber and other major developmental projects.

* * *

Stockholders of American Radiator & Standard Sanitary Corp. and Mullins Mfg. Corp. have approved the merger of the latter into American-Standard . . . Metal & Thermit Corp. and United Chromium of Canada, Ltd., Toronto, will combine their Canadian activities under the name of Metal & Thermit-United Chromium of Canada, Ltd.

* * *

India is expected to sign an agreement with Folland Aircraft Co. of Britain for the manufacture of Gnat light jet fighters in the former country.

* * *

Leyland Motors, Ltd., has signed an agreement with the Netherlands company of Van Doorne's Automobielfabrick N.V. under which the latter will have the right to manufacture Leyland Diesel engines of various sizes in horizontal and vertical forms, as well as the Albion four-cylinder horizontal and vertical 60-hp unit.

* * *

Sun Electric Corp. has started construction of a new $1 million Engineering Research and Development Center in Wheeling, Ill. . . . Consolidated Electrodynamics Corp. has established a new Advanced Electronic Data Laboratory for development of advanced equipment in the magnetic-tape data-processing field.

* * *

Aluminum alloy hand forgings weighing as much as two tons will soon be in production at the forging facility of Harvey Aluminum Co. at Torrance, Calif.

* * *

Demands of Mexican automobile assembly plants and tire manufacturers to boost prices by 20 per cent have been rejected by the government.

LONG

B-W BORG-WARNER

Long's expansion of facilities and personnel was motivated by the extension of our products to new fields and new applications.

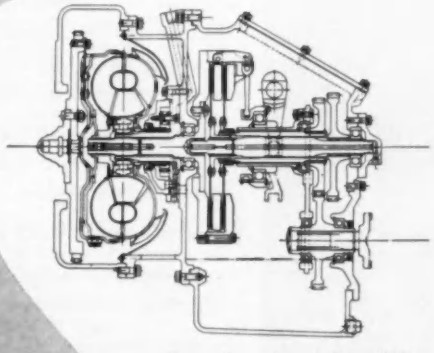
Our emphasis on the development of our manufacturing and engineering services to industry can serve you in the most practical manner—through paring costs and delivery dates.

Long experts stand ready to design and build in volume, products with a savings potential for you.

LONG MANUFACTURING DIVISION, BORG-WARNER CORPORATION

12501 DeQuindre Street, Detroit 12, Michigan

Also: Windsor and Oakville, Ontario

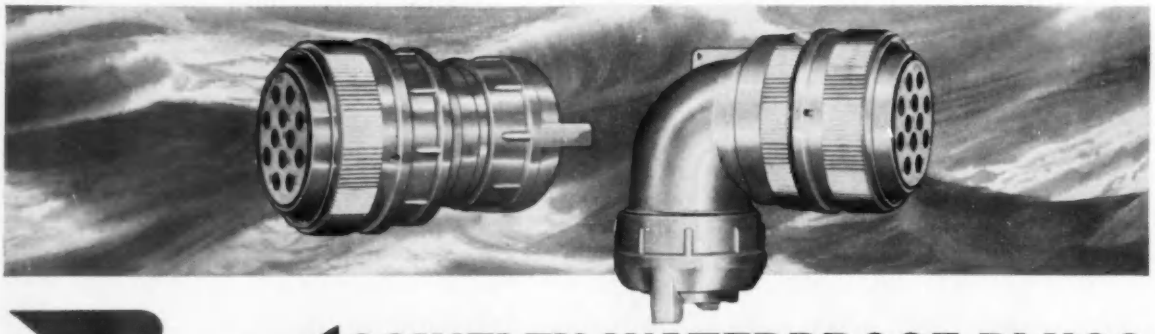


Torque Converter with Power Shifting forward and reverse gearing.

"Power Package"
TORQUE CONVERTER COMBINATIONS

Accurately engineered to your own power transfer requirements, B-W torque converter transmission combinations provide extra rugged construction, reduced maintenance costs, greatly improved performance. Now available in package form are any of the Borg-Warner volume production drive line products . . . a wide variety of torque converters • transmissions • industrial and agricultural clutches • power takeoff and speed reducers • and many other "Power Package" combinations.

THE STANDARD OF QUALITY AND PERFORMANCE SINCE 1903



Bendix SCINFLEX WATERPROOF PLUGS

FOR USE WITH MULTI-CONDUCTOR CABLES!

These new Bendix*-Scinflex *waterproof* plugs are a modification of our standard AN type "E" (environment resistant) connector. They are designed to meet all "E" performance requirements when used with multi-conductor cables. Each plug includes a modified AN-3057B cable clamp which provides inward radial compression on multi-conductor cables. This unique feature completely eliminates cable strain—a common source of circuit trouble.

In addition, there are gaskets at all mating surfaces and an accessory sleeve is available to accommodate an extreme range of cable sizes. A descriptive folder is available on request.

*TRADE-MARK

THESE BUILT-IN FEATURES ASSURE TOP PROTECTION AGAINST CIRCUIT FAILURE:

Shock and Vibration Resistant • Die Cast Aluminum Shell • Cadmium Plate—Olive Drab Finish • Moisture-Proof, Pressurized • High Arc Resistance, High Dielectric Strength • Silver-Plated Contacts • Resilient Inserts

Bendix **SCINTILLA DIVISION OF** Bendix AVIATION CORPORATION

SIDNEY, NEW YORK

Export Sales and Service: Bendix International Division, 205 E. 42nd St., New York 17, N. Y.

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PRODUCTION
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GREY IRON CASTINGS

ONE OF THE NATION'S LARGEST AND MOST MODERN PRODUCTION FOUNDRIES

ESTABLISHED 1866

THE WHELAND COMPANY
FOUNDRY DIVISION

MAIN OFFICE AND MANUFACTURING PLANTS
CHATTANOOGA 2, TENNESSEE

Continuous Duty
D.C. SOLENOIDS

Model SD-A

Synchro-Start MODEL SD SOLENOIDS have an exceptional amount of power over a long stroke. The sealed casing protects these solenoids from seepage of dust and liquids. They are available with standard terminal studs (Model SD) or with the aircraft type AN Connector (Model SD-A).

Specifications—SD Solenoids can be furnished in all standard voltages up to 115 Volts D. C.

10 lb. pull over 1½ inch stroke.

Power consumption, 550 Watts pulling and 8 Watts holding.

Housing dimensions, 4⅝" x 2½".

SYNCHRO-START PRODUCTS, INC.
8151 N. RIDGEWAY AVE. • SKOKIE, ILLINOIS

Manufacturers of AUTOMATIC ENGINE CONTROLS
SAFETY CONTROLS • OVERSPEED GOVERNORS
and CONTROL EQUIPMENT

Industry News

(*Continued from page* 94)

Sizable Sums for Maintenance Needed by Defense Operations

Each year $60 to $70 million must be added to the national defense budget for maintenance of facilities. This statement was made by O. W. Graveley, Director of Maintenance, Office of the Assistant Secretary of Defense, at the Seventh National Plant Mainten nce & Engineering Show in Philadelphia last month.

When interviewed by an AUTOMOTIVE INDUSTRIES representative, Mr. Graveley said that maintenance of defense plant and equipment, exclusive of ordnance, requires four to five per cent of the total defense budget.

On the subject of automotive maintenance, Captain E. J. Peltier, assistant chief for maintenance and material, Bureau of Yards and Docks, Navy Dept., replied that the Navy has cut costs from five cents to three cents per mile at an annual saving of some $12 million. He has 38,500 general purpose vehicles in his command, plus many thousands of specialized types. The Captain also mentioned that a vehicle standardization plan is under way, but did not elaborate on the subject.

On the subject of material or product specification for minimum maintenance, Mr. Graveley told AI that his department makes recommendations to the services when new plant or equipment contracts are drawn up. There are no binding regulations, just recommended minimum requirements to use as a guide. The services, however, are free to draw up their own specifications.

There were about 400 exhibitors at the show. According to the show management, approximately 24,000 executives and engineering personnel attended the Show and/or conferences.

National Plastics Exposition Set for June in New York City

The Seventh National Plastics Exposition will be held from June 11 to 15, at the new Coliseum in New York City. Presented by The Society of the Plastics Industry, Inc., exhibitors will include companies from all over the U. S. displaying the latest plastics end-products and the newest raw materials. They will also demonstrate the latest developments in machinery, equipment, tools, dies, molds, and plastics manufacturing processes.

These exhibitors will be molders, extruders, laminators, calenderers, processors, converters, printers, embossers, heat sealers, stitchers, slitters, coaters, fabricators, vacuum-formers, and reinforced plastics products manufacturers.

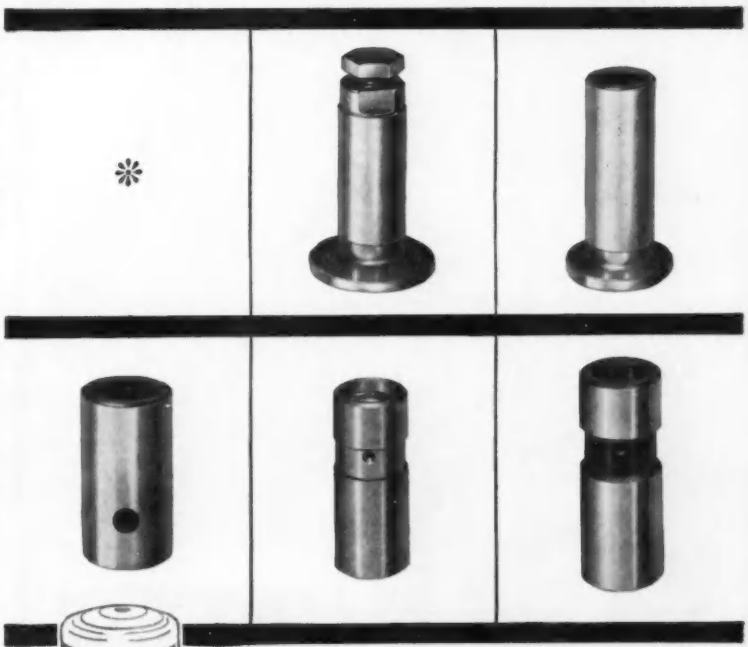
A conference on plastics will be held at the same time. This event will feature talks on new markets for plastics products and informed discussions on future applications for plasties in a number of industries.

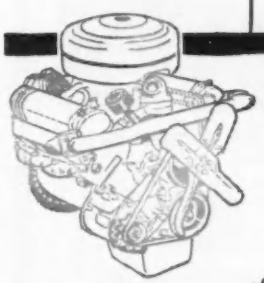
Toledo Electronics Gets Order For Missile Tester

Toledo Electronics Div. of Kaiser Aircraft & Electronics Corp. has received contracts valued at approximately $350,000 for design and construction of a new automatic missile system tester. Called the "Go-No-Go," the apparatus allows the firing crew to simulate actual flight and operation of a guided missile without actually firing it.

(*Turn to page* 178, *please*)

JOHNSON *tappets*





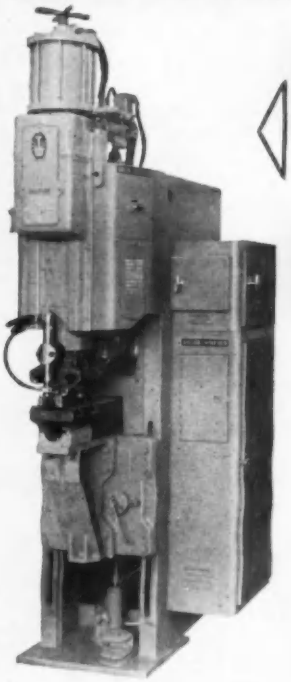
* *keep pace with today's engines*

Continual experimentation and excellent manufacturing methods show a steady product improvement that make JOHNSON TAPPETS worthy of your consideration. Only proven materials, covering a range of steel, chilled iron, and various iron alloys are used in the manufacture of JOHNSON TAPPETS, providing greater strength, light weight and increased wear resistance. Serving the AUTOMOTIVE — AIRCRAFT — FARM — INDUSTRIAL — MARINE Industries.

"tappets are our business"

JOHNSON JP PRODUCTS

MUSKEGON, inc. MICHIGAN

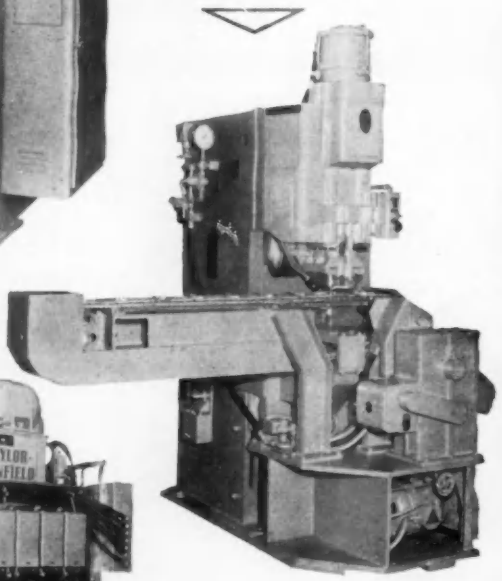


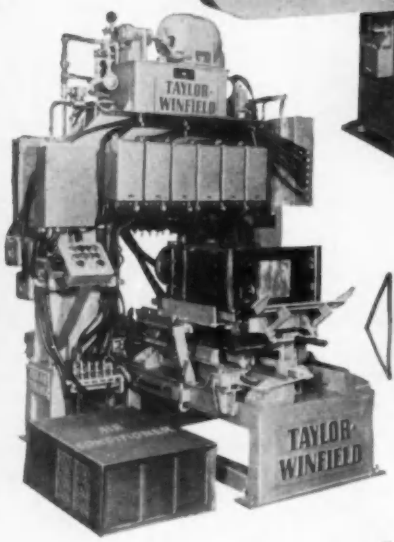
A STANDARD T-W RESISTANCE WELDER

Versatile uses; prompt delivery; lowest price.

OR A STANDARD WELDER MODIFIED

Special tooling; mechanized loading and unloading; increased production; low cost re-tooling.





OR A SPECIAL WELDER DESIGNED FOR YOUR WORK

Volume production at lowest unit cost.

Resistance Welders Since 1898

Sales and Service

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DAYTON • DENVER • DETROIT
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PORTLAND, OREGON • SEATTLE
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OAKVILLE AND WINDSOR, ONTARIO

TAYLOR-WINFIELD
RESISTANCE WELDERS

THE TAYLOR-WINFIELD CORPORATION WARREN, OHIO

Industry News

(*Continued from page* 177)

British Vehicle Production, Aircraft Exports Hit Highs

British motor vehicle production reached a new high in 1955 with a total of 897,562 cars and 329,851 trucks and buses. A further rise in output is expected this year, despite the selling difficulties reflected by Austin's cutback.

Exports of 373,203 automobiles were the highest since 1950. However, this was only a two per cent gain over last year, and the proportion of output dropped to 41.5 per cent. Shipments to Australia, South Africa and Rhodesia increased, but those to America, Canada, and Sweden declined substantially.

Commercial vehicle exports were 25 per cent above 1954 and the highest yet. Sales rose in all overseas markets. Exports of farm tractors fell slightly to 106,954 machines.

Aircraft exports in 1955, valued at $185 million, established a new record. One-third of this figure was engines. Civil, rather than military, aircraft are expected to account for a major part of future sales. Outstanding orders for Comets, Britannias, Viscounts, and Vanguards now stand at $420 million.

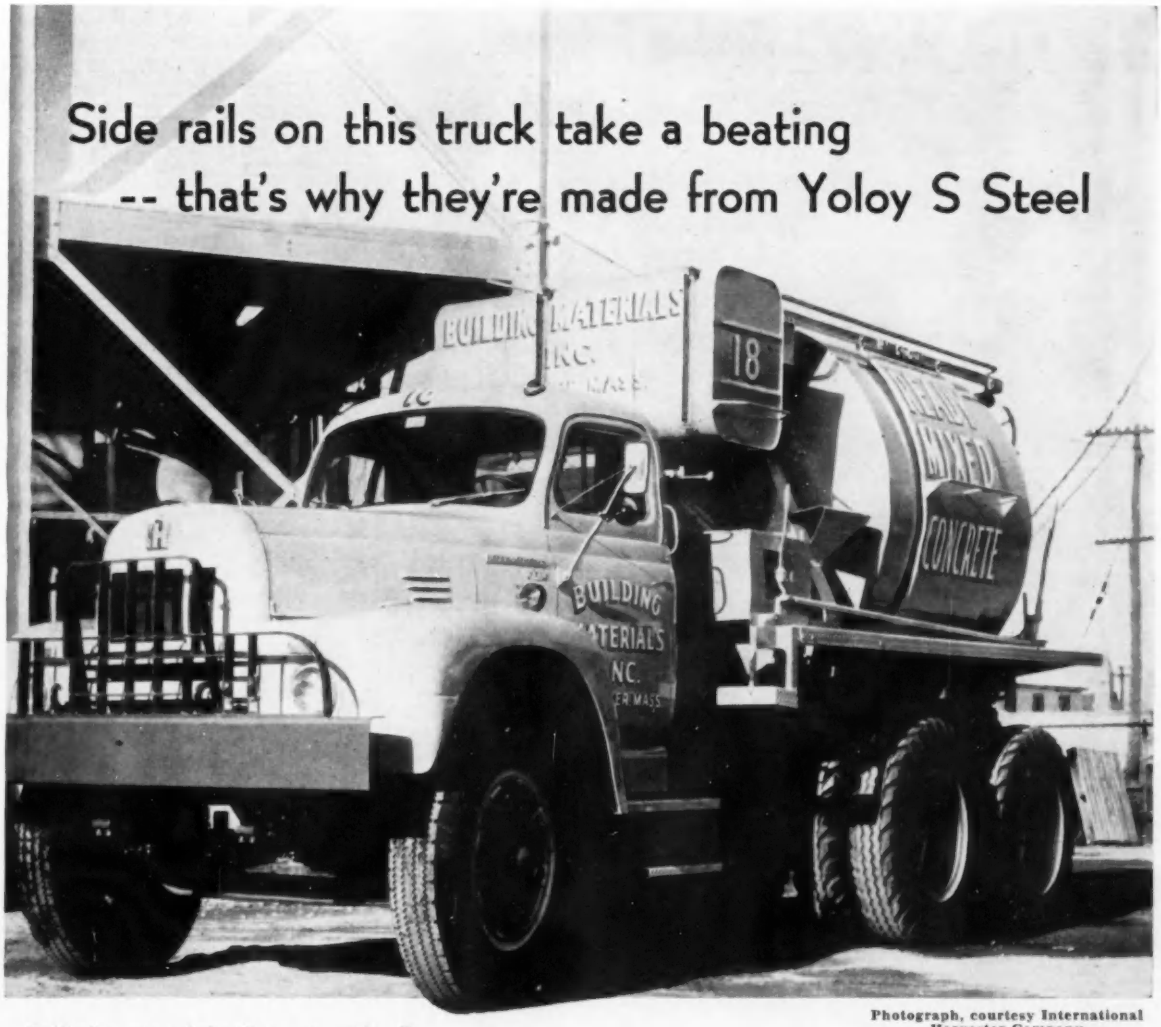
Army Contract Visualizes Nuclear-Powered Vehicles

The Army has awarded a contract to Nuclear Development Corp., White Plains, N. Y. to determine the technical feasibility of applying nuclear power to Transportation Corps equipment used in land and water operations.

Items to be considered in the study will include certain rail locomotive equipment, several types of Army harbor and inland waterways craft, and special cargo-carrying land vehicles of a large size known as "land trains."

The Army considers that the application of nuclear power to the field of military transportation has a great potential and will materially assist in attaining the degree of strategic mobility required for modern warfare. The $100,000 contract is the first to contemplate the application of nuclear propulsion to such transportation equipment as overland vehicles, harbor and inland waterways craft, and rail locomotion.

Side rails on this truck take a beating -- that's why they're made from Yoloy S Steel



Photograph, courtesy International Harvester Company

Built for rugged hauling, on and off highways, this mixer truck has to have side rails that can take it—that's why they are made from Yoloy S Steel.* Yoloy S because its' a higher strength steel, 65,000 lbs. per sq. in. minimum yield strength, especially made where higher strength to weight ratios from normal construction is required for additional stamina. It has higher resistance to corrosion, abrasion, shock and vibration. The higher strength of Yoloy S permits valuable reduction in dead weight.

International Harvester, whose Model RF-230 is shown above, is just one of many prominent manufacturers who include Yoloy steels in their building specifications. If you have a problem, we would like to help you. Our District Sales Office near you is ready to supply information and service on the specific steels in the Yoloy Family that best meet your needs.

*Yoloy S frames fabricated by The Youngstown Steel Car Co., Niles, Ohio.

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VTOL Aircraft Among Subjects at the 24th Annual Meeting of IAS

The Institute of the Aeronautical Sciences held its 24th Annual Meeting in New York last month before a record group consisting of engineers, company executives, scientists and military personnel. During the four-day session, 82 technical papers were presented on subjects varying from air traffic to earth satellites.

At the technical sessions, much interest was shown in VTOL aircraft as three organizations presented their ideas on a vertical-rising transport. NACA gave a hypothetical design of a 40-50 passenger transport using four Allison T-56 turboprop engines on a rotatable wing and two small jets in the tail. The jets would be of the Rolls-Royce Soar type. The wing would be rotated from vertical for takeoff to horizontal for normal flight while the jets would provide vertical control. Hiller Helicopter, although basically agreeing with the NACA proposal, would prefer to use tail rotors rather than jets on the transport aircraft for vertical stability. A rather different proposition was presented by Bell Aircraft. The Bell design calls for ducted propellers which would rotate instead of the wing. The propellers would be mounted on each wingtip. For hovering stability, Bell proposes either a jet stream from the tail or varying the air stream speed from the ducted propellers.

Dr. Edward R. Sharp, director of the Lewis Flight Propulsion Laboratory of the National Advisory Committee for Aeronautics, was elected president of IAS for 1956.

Dr. Sharp, who was vice president of the IAS in 1955, is the Institute's 24th president. He succeeds Robert E. Gross, who is president and board chairman of Lockheed Aircraft Corp.

The Institute's Council also elected four vice presidents and the treasurer for 1956. The vice presidents are: William B. Bergen, executive vice president of The Glenn L. Martin Co.; Victor E. Carbonara, president of Kollsman Instrument Corp.; Edgar Schmued, vice president in charge of engineering, Northrop Aircraft, Inc.; Raymond C. Sebold, vice president for engineering, Convair Div., General Dynamics Corp. For treasurer, the Council chose Sherman M. Fairchild, chairman of the board of Fairchild Camera and Instrument Corp. and a director of Fairchild Engine and Airplane Corp.

The Institute presented four annual awards for outstanding contributions to aeronautics. The winners were: Capt. Wilbur E. Kellum, USN, commander of the Naval Medical Research Institute, Bethesda, Md. (Jeffries Award for 1955); Lt. Col. Robert C. Bundgaard of the USAF Air Weather Service, Andrews AFB, Washington, D. C. (Losey Award); H. Julian Allen of Ames Aeronautical Laboratory, National Advisory Committee for Aeronautics, Moffett Field, Calif. (Reed Award); and Giles J. Strickroth, manager of the Electronics Department of The Glenn L. Martin Co., Baltimore (Sperry Award).

The Daniel Guggenheim Medal for 1955 was presented to Dr. Theodore von Karman, noted aerodynamicist and educator, who is now chairman

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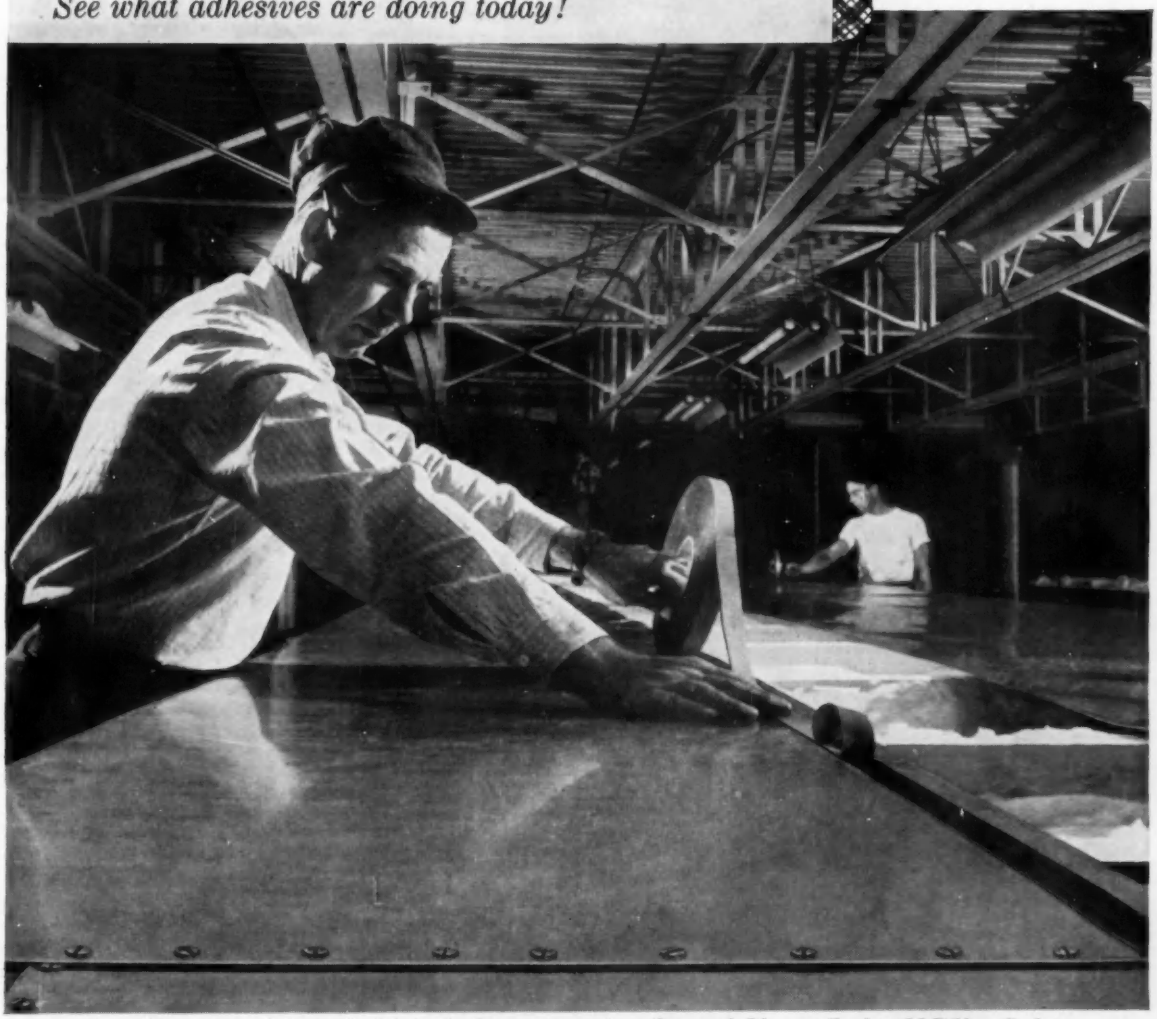

The ribbon you see helps make this trailer home snug and weatherproof. It's an adhesive 3M Ribbon Sealer.

Fighting weather with a ribbon

Sealing weather out of trailer homes used to be a problem. Water sometimes leaked through seams, spoiling interiors, wetting insulation, corroding metal. But today this manufacturer seals all exterior lap seams with an adhesive 3M Ribbon Sealer. Since using EC 1202 he has had *no leaks* in exterior seams. This 3M product fights weather right to a standstill.

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of the Advisory Group for Aeronautical Research and Development of the North Atlantic Treaty Organization (NATO).

Speaking of the Viscount operation of Capital Airlines, J. H. Carmichael, president of the line, stated that passenger volume has remained steadily high since service was introduced last July. In the first weeks of Viscount operation, the line was operating 1,200,000 seat miles a week at a load factor in the low eighties. Today, Capital is operating three times as many seat miles with a load factor declined only a point or so despite this expanded mileage. "It may be interesting," he stated, "that in the 25,000 engine hours accumulated with the Viscount in scheduled service, there has not been one case when a flight was cancelled because of engine failure."

"Guillotine tests," using a full-scale pressurized fuselage section, have proved the tear-resistance and damage-limiting features of Boeing-designed airplane structures, according to a paper presented by Arne Sorensen, Boeing Structural Development Unit chief. He reported that safe structure can be designed by proper selection of material and stress level, or by incorporating certain damage-limiting features in the design.

One of the series of tests behind the sturdy and safe structure was carried out with a full-scale pressurized fuselage section. The fuselage section was made of 7075-T6 aluminum alloy frames and stiffeners with 2024-T3 aluminum skin. To stimulate possible in-flight damage, "guillotine tests" were carried out, with a heavy arrowhead-shaped blade piercing the pressurized fuselage section. Boeing structural engineers found there was no tendency for the cut to grow length-wise beyond the original damage to the fuselage. The cut increased in width by the formation of a very small metal flap.

"It is believed that puncture tests of this nature should adequately demonstrate the structural integrity of a pressure fuselage against reasonable in-flight damage," the paper stated.

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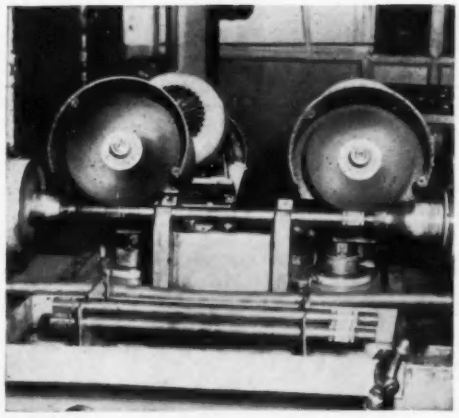
New quality finish gives transmissions longer life



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MACHINERY NEWS

(*Continued from page* 79)

chased new gas fired heat treating furnaces to take care of the longest shafts produced by U. S. Axle.

Motch & Merryweather Co., Cleveland, has sold its Triple M Products Div., which produced a line of multi-purpose garden tools.

Lake Erie Engineering Corp. has put out a color film on hydraulic presses. The film takes the viewer through various installations and illustrates the use of hydraulic presses for stretch forming, cold extrusion, flanging, forging, drawing, and forming. Called "Pressure on Metalworking Production," the 16 mm film is available on a loan basis from Lake Erie in Buffalo.

Ex-Cell-O Corp. will begin manufacturing operations at a newly acquired plant in Elwood, Indiana, early this year. Plans are to devote the entire 66,000 sq ft of floor space to the production of jet compressor rotor blades and steam turbine blades.

BOOKS . . .

SELECTED COMBUSTION PROBLEMS, *published by Butterworths Publications Ltd., London, England, available from Interscience Publishers, Inc., 250 Fifth Ave., New York 1, N. Y. Price, $8.00.* This volume was sponsored by the Advisory Group for Aeronautical Research and Development of NATO, as a means of encouraging increasing research efforts in the field of the science of combustion. There is recognition that with the advent of jet propulsion it is imperative to secure a better theoretical understanding and more experimental knowledge of the combustion phenomena in combustion chambers and rockets. The book contains a selected list of the more acute combustion problems discussed in detail by experts, and while not claiming to give final solutions, the aim is to inspire a clearer understanding of the fundamentals and attempt integration of partial knowledge.

TIN LIZZIE, *by Philip Van Doren Stern, published by Simon and Schuster, 630 Fifth Ave., New York 20, N. Y. Price, $3.95.* Attractively-presented and profusely-illustrated, this book gives a case history of the Model T Ford dating from events just prior to its inception to its present status. It should be of interest to all having an automotive background or hobby.

DESIGNING FOR INDUSTRY, *by F. C. Ashford, published by Philosophical Library, Inc., 15 E. 40th Street, New York 16, N. Y. Price, $7.50.* The newcomer to industrial product designing will find it difficult to discover one volume which gives a complete picture of the field. This book seeks to remedy that situation. Everyone concerned with the design and development of products should find in this book some information to instruct, interest and encourage him in his work.

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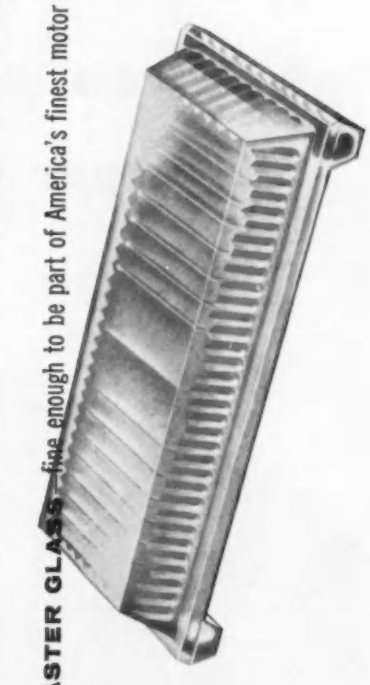

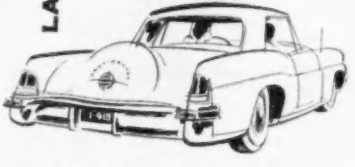

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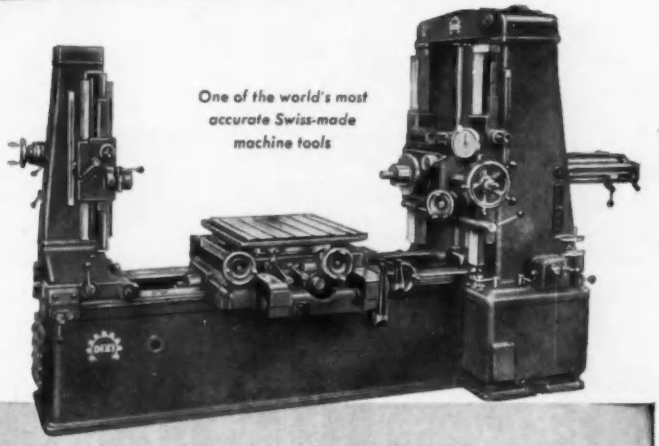

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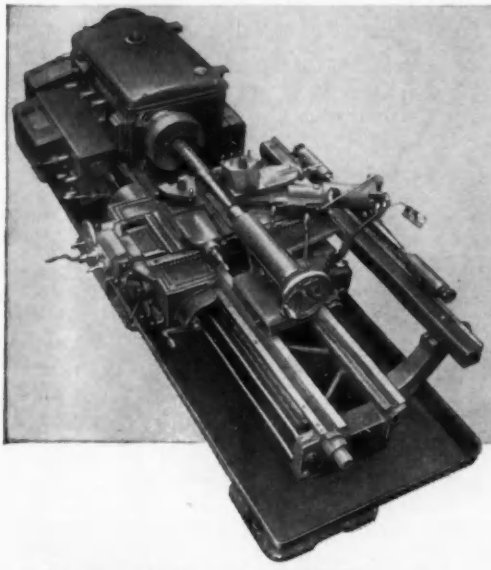

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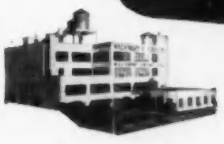

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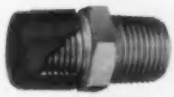

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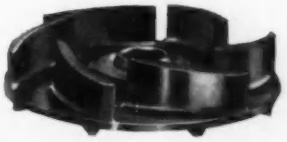
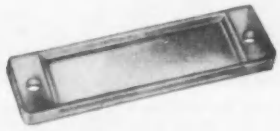


. . water pump impeller A special moisture resistant phenolic was specified for this part which must withstand the extremes of both high heat and intense cold, as well as strong torque action plus corrosion and cavitation resulting from the circulation of water in the car's cooling system.

. . timing gear The molded blank of this gear had to have high flexural characteristics . . also a good bond in the laminate section for ease in cutting gear teeth, and to insure necessary tooth strength. The manufacturer and Richardson developed a new material with high heat resistance. Result: Fine flexural strength in the web section . . more quiet operation . . . easier fabrication . . . easier assembly . . . *tripled gear life!*

. . radio antenna mast base This part had to have good surface appearance, high impact strength, high dielectric strength, and at the same time be weather resistant. A black phenolic material with an attractive high gloss finish was recommended.



. . dashboard light lens Originally this part was designed as a clear lens. Later, when the specifications were changed to call for a translucent lens, the customer suggested that either the mold, or the clear parts, be sandblasted. . either process would have increased costs. Richardson suggested, instead, a special light-transmitting polystyrene. Result: 15% reduction in lens cost.

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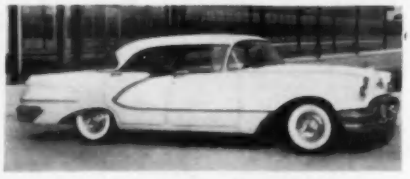

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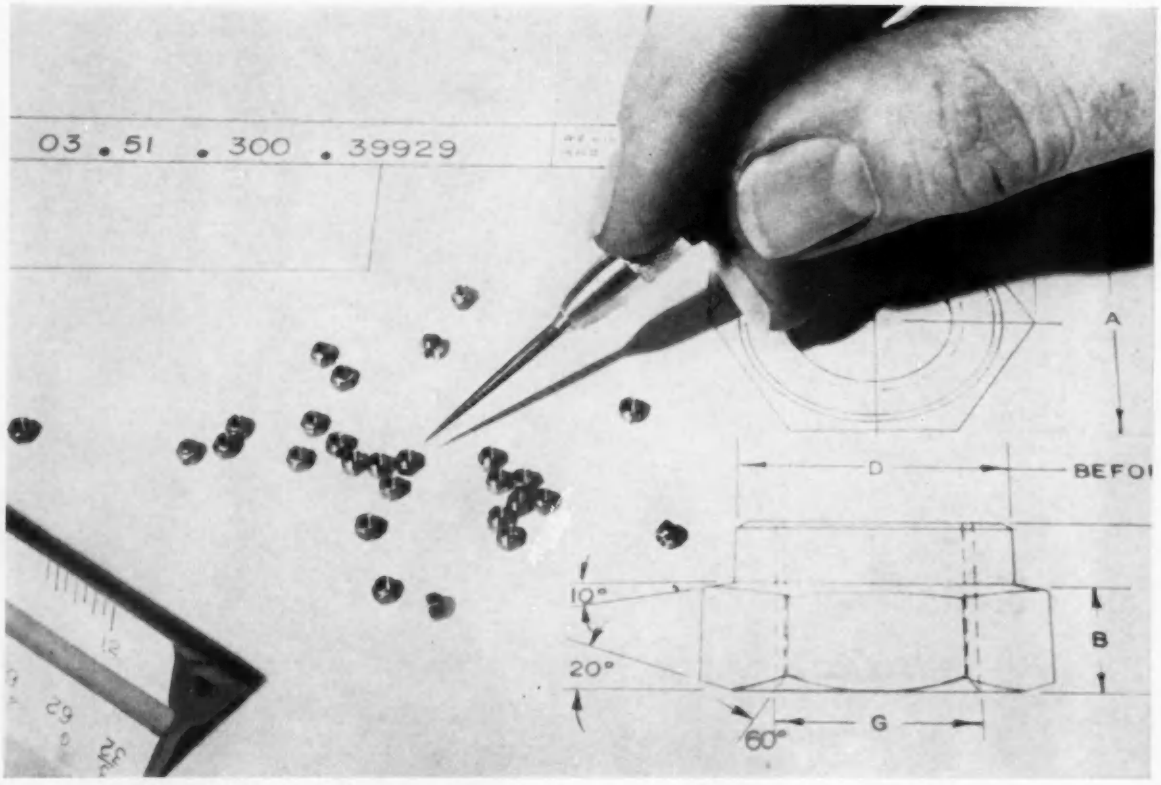

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Standard Miniature Locknuts Permit Design Engineers to Develop and Fasten Smaller Assemblies Safely

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	MAX.	MIN.	MAX.	MIN.	MIN.	
0-80 NF-3B	.111	.107	.047	.042	.123	.075
1-64 NC-3B	.127	.123	.0635	.0585	.141	.090
1-72 NF-3B	.127	.123	.0635	.0585	.141	.090
2-56 NC-3B	.158	.153	.068	.063	.176	.105
2-64 NF-3B	.158	.153	.068	.063	.176	.105
3-48 NC-3B	.190	.183	.071	.066	.210	.120
3-56 NF-3B	.190	.183	.071	.066	.210	.120
4-40 NC-3B	.190	.183	.072	.067	.210	.120
4-48 NF-3B	.190	.183	.072	.067	.210	.120

STANDARD FLEXLOC Micros—in sizes ranging from 0-80 to 4-48—are available in brass (either plain or cadmium plated). Consult SPS for miniature nuts of other conventional materials.

New FLEXLOC Micro locknuts are smaller and lighter than regular FLEXLOCS of the same nominal diameter. Wrenches of smaller size are used to install them. Mating joints or flanges can be designed smaller—with no loss in strength or convenience of assembly.

FLEXLOC Micros have all the advantages of larger FLEXLOCS. One-piece, all-metal construction—nothing to put together, come apart, lose or forget. Use them as lock or stop nuts—they stay put anywhere on a threaded member as soon as the locking threads are fully engaged. Uniform locking torques insure accurate preloading. There are no nonmetallic inserts to pop out or deteriorate. Moisture, dryness, oil, temperatures to 250°F won't affect these Micro nuts. Just screw them on. They lock and stay locked. Vibration won't shake them loose.

For complete information on FLEXLOC Micro locknuts, consult your authorized SPS distributor. Or write STANDARD PRESSED STEEL CO., Jenkintown 53, Pa

STANDARD PRESSED STEEL CO.

FLEXLOC® LOCKNUT DIVISION SPS

JENKINTOWN PENNSYLVANIA

Inspection with Magnaglo and black light reveals a crack in this axle.

How MAGNAGLO* Helps Cut Costs

—and Insures Reliable Quality at Clark Equipment Company

Finding crack-type defects in parts during production helps to keep costs down, and insure safety and dependability. These are prime aims at Clark Equipment Company. They know these aims can best be realized by methods that produce consistent reliable quality, economically.

To be sure of this, they utilize Magnaglo inspection. It is faster than visual—and much more accurate. Magnaglo helps find any possible cracks and helps determine the cause.

They save money by using inspection with Magnaglo to eliminate much waste motion. Time is not spent in completing cracked parts, since defects are discovered in the rough stage. Machining and labor costs are thus reduced, to keep Clark's costs and prices low and very competitive.

The $2500 Magnaglo unit was originally purchased as an aid to inspection in the axle shaft department. The inspection has now proven of value on many other parts, including knuckles, arms, and drive axles. Good sampling inspection practices usually serve to control quality in transmission and steering parts, bushings, tie-rod ends and bolts, and find "bugs" in manufacture before they cost money.

Quite likely one of the many Magnaflux Corporation test methods can do the same for you. Various methods work on every type material, at any stage of manufacture. Kits and units sell from $35.00 up to a few thousand dollars. No license required. Ask to have a Magnaflux* engineer call—or write for our bulletin on LOWER PRODUCTION COSTS.

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Proof of the pudding—a Clark fork truck operator deposits a skid of axles at the Magnaflux inspection station. Axles of this truck were originally inspected here.

For the past ten years, Clark Equipment Company has been using a Magnaflux unit similar to this model DR-543, with Magnaglo and hood. Other models at low price are available to suit your requirements.

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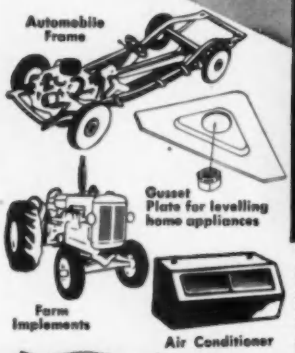

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All replies kept confidential

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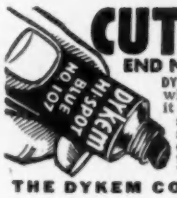

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TOMORROW'S ENGINES

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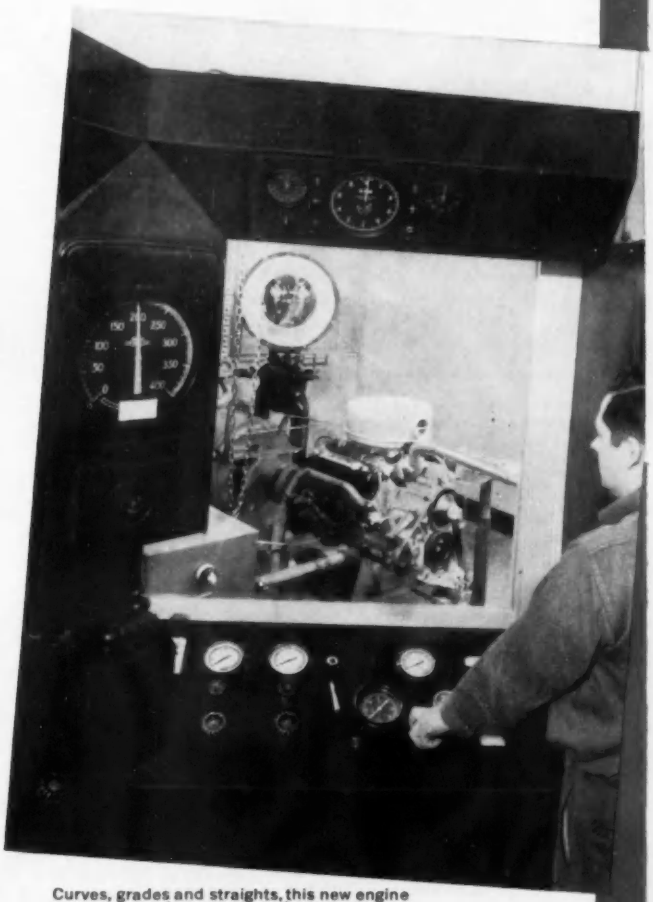

Curves, grades and straights, this new engine never leaves its soundproof test room at Muskegon yet experiences all of these driving conditions. "Motor run" test rooms like this enable Muskegon engineers to anticipate ring requirements . . . test ring designs.

No matter what the design of the individual rings needed to fill the grooves of your piston, rely on Muskegon as your source.

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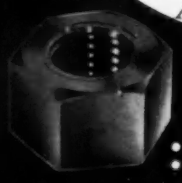

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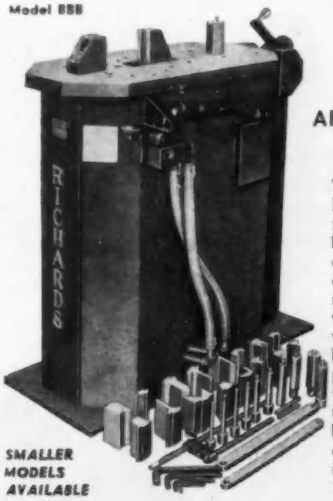
Multiform BIG BROTHER BENDER

Illustrated above are a few of the many forms that can be produced efficiently on the Multiform Bender.

Model BBB



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AIR OPERATED MODELS IN FOUR SIZES

The heavy duty Big Brother Bender is designed for fabricating bus bars, brackets, fixtures, etc., without special tooling. Air controlled with finger tip response. Comes complete with dies, mandrels and wrenches — punching and blanking dies extra. Will punch holes up to 1" and form material up to ¼" thick by 4" wide. We also build smaller models, hand or air operated, for bending materials up to ⅛" x 1½".

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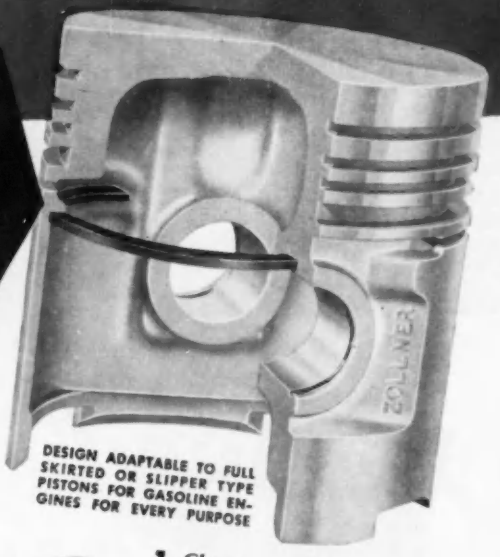
STEEL TENSION MEMBER

Anchored only at pin bosses and cast in positive contact with I.D. of piston skirt

Controls Clearance Automatically



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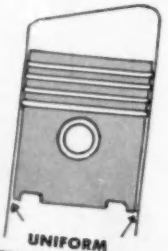
Sensational Performance

Requires less than .001 Clearance

Cold or Hot, Clear-O-Matic Piston clearance stays constantly uniform. Required clearance is reduced to less than .001. This great development of the "All-Temperature" Piston by Zollner engineers provides another fine feature attraction for the modern motor car . . . smooth, quiet running engine . . . no cold slap . . . reduced friction without loss of durability or heat conductivity . . . no danger of scuffing or seizing. We suggest a test of these sensational performance advantages for your engine.



UNIFORM EFFECTIVE SKIRT CLEARANCE AT ALL TEMPERATURES

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2. Effective expansion identical with ferrous cylinder.
3. Steel tension member, with same effective expansion as cylinder, maintains uniform skirt clearance through entire temperature range.
4. Normal diametric clearance usually less than .001 with uniform skirt bearing.
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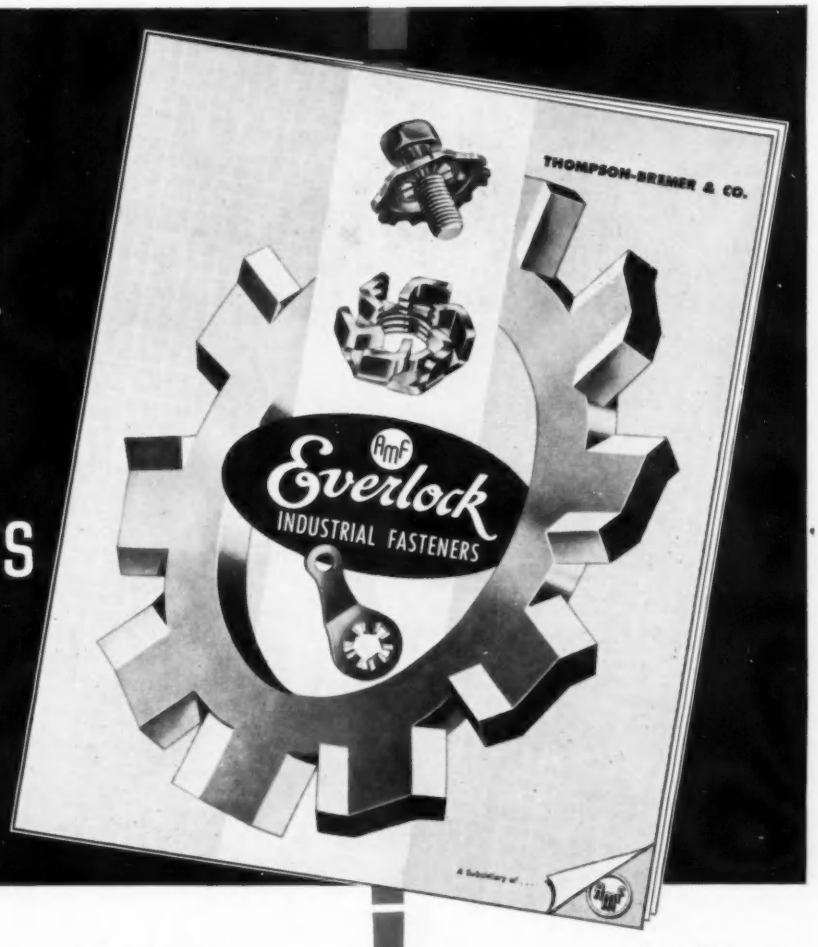

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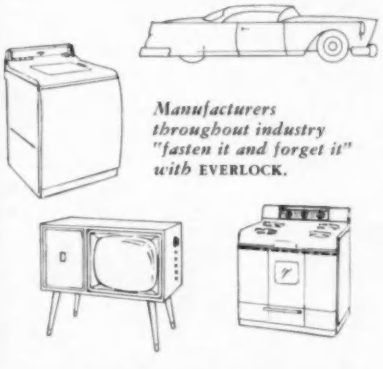

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